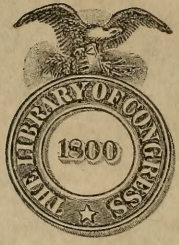
BUSH-FRUITS

BY

F. W. CARD

The Rural Science Series

L. H. Bailey *Editor*



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The Rural Science Series

L. H. Bailey, Editor

BUSH-FRUITS

The Rural Science Series

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Plate I. Blackberries in bloom.

BUSH-FRUITS

BY

FRED W. CARD

NEW AND REVISED EDITION

New York

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EXPLANATION

The book on Bush-Fruits was first published in 1898, when the author, Fred W. Card, was professor of horticulture in the Rhode Island College of Agriculture and Mechanic Arts. He had held a similar chair in the University of Nebraska, and as a post-graduate student in Cornell University he had made a special study of these fruits and the book grew out of a thesis on the subject. The book is revised by the author, now a farmer on his own farm in Pennsylvania, with the purpose to make it as useful as possible to the actual grower of the fruits. The bulletin literature of the subject has also been gone over and assorted. The cultural methods have not changed greatly, however, and even many of the old varieties are still commercially important. The parts on insects and diseases have been revised by specialists. The botanical accounts, which were a feature of the old book, are omitted because fuller treatments are now accessible. The author wishes to express his special obligation to members of the staff of the New York Agricultural Experiment Station (Geneva), particularly to F. C. Stewart and O. M. Taylor; also to F. V. Coville, United States Department of Agriculture, for aid in the discussion of the blueberry. The author now places the book before the public in its new dress as a practical manual on the usual growing and handling of currants, gooseberries, blackberries, dewberries, raspberries, blueberries, and a few minor woody small-fruits.

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BUSH-FRUITS

BUSH-FRUITS

PART I

GENERAL CONSIDERATIONS

CHAPTER I

INTRODUCTORY DISCUSSION

Bush-fruits occupy a place of their own in the pomological field. They do not meet the universal demand that does the strawberry, and cannot be grown on such an extensive scale under most conditions. Neither have they the stability and lasting qualities of the tree-fruits, but they fit into their own place between the two and fill there an important position.

Their place in the home-garden is assured and needs no comment. Each kind is a favorite of some persons, and all are relished by most people. To the busy farmer they offer a healthful and appetizing luxury with a minimum outlay of labor. To the business or professional man seeking rest and relaxation in his garden, they afford a delightful pastime as well. For the additional attention which he is likely to give, they will return increased lusciousness and beauty, coupled with the personal interest that accompanies a product of one's own growing.

In the commercial field, the position of these fruits is varied. The demand is unequal, the uses different, and the success attendant on their culture greatly dependent

on local conditions. The census of 1910 shows a falling off in the acreage devoted to all lines of small fruits in the United States. Even the strawberry, which is much more largely grown than any of the others, lost ground by some 8,000 acres within the previous decade. Blackberries and dewberries, which are classed together, nearly held their own. Raspberries and loganberries, which are also grouped under one head, dropped from 60,916 acres in 1899, to 48,668 acres in 1909, the greatest decrease being in the East North-Central division. A marked exception to the general decline is shown by these two fruits in the Mountain and Pacific divisions. In the latter the acreage more than doubled within that period. This is probably due in great part to the introduction and extensive planting of the loganberry. Currants and gooseberries both lost heavily during this period.

Large areas of some of the bush-fruits are grown at times, but their more important place is in diversified fruit-growing. Under exceptional conditions, with an assured market at hand, the growing of large areas of a single fruit may be wise, but under normal conditions it is likely to be fraught with disappointment. The production and consumption of strawberries is nearly or quite as great now as ever, but the tendency is apparently away from larger areas, the total product being grown by a much larger number of men, most of whom supply the demands of their own locality, rather than depend on the wider wholesale markets of the country. This tendency is doubtless wise, for the home market is often the best.

Personal experience may serve as an illustration. Located in a general farming community, remote from large

centers of population, to market any fruit extensively would mean shipment to distant points. This is a convenient outlet for surplus, but the net returns are nearly always less than those secured at home. This home market never pays the fancy price that the grower is likely to hold in his mind as the ideal for his efforts; neither does it expect to secure fruit at the glut prices which often prevail in the large markets. This market will take what it requires, at prices that afford fair profits to the intelligent grower. It is the part of wisdom to try to meet the demands of this home trade. This means that the grower should raise more of some things, and leave out other things which he would like to grow. If he grows gooseberries, the home market may not want them; these must be shipped. For strawberries and raspberries the market is hungry. He can therefore grow a certain quantity at a good profit, while to grow them largely would doubtless prove unprofitable. Peaches, likewise, are much in demand. The best trade is often from the farmers, who sometimes come as far as ten miles to get the fruit and take it home with them. These persons come to look the grower's way for such fruit as they want whether he grows it or not. It is wise to meet their demands more fully.

It will readily be seen that the conditions prevailing at such a location are very different from those in a strictly fruit-growing locality, where most farmers are producers rather than consumers. Yet many a grower will find its counterpart in his own situation. Its citation merely serves to emphasize the old problem of diversity of surroundings and the need of individuality in meeting a given problem.

THE LOCATION

The question of location may oftener than otherwise be a problem of adaptation, provided the growing of bush-fruits is merely to fit into some general scheme of agricultural operations. If one is bent on doing some certain thing, and that alone, then one should study the matter of location well, and choose a site adapted to his needs. This is seldom done. More frequently other considerations determine where the anchor shall be cast. The problem must ever be an individual one. Any attempt to solve it in a large way will be futile and result in little but useless generalities. Let the grower study well his tastes and his surroundings, talk with fruit handlers in the community, then learn from experience. There is no other way.

No attempt will be made here to discuss the adaptability of different regions of the country to the growing of bush-fruits, yet this is an important consideration for the commercial grower. The writer was unable to grow raspberries and blackberries successfully in the dry climate of the Plains region, and met with no marked success in the fickle climate of the New England coast. This does not mean that these fruits cannot be grown in these locations. It does mean, however, that the difficulties are greater than in the region of the central states. Deficient moisture in one case, and excessive moisture in the other, had much to do with results.

Summer heat is a greater enemy than winter cold over much of the United States, especially in the southern states and the semi-arid regions of the West. In many such localities bush-fruits cannot be profitably grown.

A cool moist locality is much more favorable for all these fruits than a warm and dry one. Black-caps succeed better on the Plains than either red raspberries or blackberries, while in the South blackberries thrive better than raspberries. Propagation of black-caps is found to be much more difficult in the far South, requiring partially shaded locations for success.

THE SITE AND THE SOIL

The immediate location or site is a matter of importance with the bush-fruits. All are subject to injury from spring frosts, and are therefore safer on elevated land. All are subject to injury from summer drought and excessive heat. The ideal location, therefore, is a cool northern exposure which does not feel the full effects of the sun's rays in midsummer. In practical farm operations other things usually determine the particular location of a plantation, but if a choice is available there is an advantage in choosing as above.

Bush-fruits will thrive on almost all soils but most kinds do best on strong moist land, which is deep and porous, but well drained. Heavy undrained soils are unsuitable and should never be chosen. All are not equally well adapted to every kind of soil. If a range of soils were available, the dewberry would naturally take its place on the light sand, the red raspberry and the blackberry on the lighter sandy loams, the black-cap on the heavier sandy or lighter clay loams, with the currant and gooseberry on the strong clay loam or even on fairly stiff heavy clay. Varieties differ also, especially among the brambles.

Strong rank growers may develop too much cane-growth with deficient fruiting qualities if the soil is heavy and rich. This is particularly likely to occur with blackberries and red raspberries. Winter-killing is often the sequel to rank growth of canes.

Drought resistance is really the prime essential to be sought in the choice of soils. The soil which will provide the best supply of moisture during the ripening period is the one which is likely to give the most profitable returns. This quality can be greatly enhanced by methods of handling. A soil which is well filled with humus, and in good tilth, will withstand drought far better than a similar one which lacks humus and is not well tilled. Recently turned sod is objectionable because inconvenient to furrow and plant. It is difficult thoroughly to firm the soil about the roots in such land. The percentage of loss is therefore likely to be higher and the rate of growth slower. But the sooner after the sod has rotted that the field can be planted, the better will be the conditions for growth. Hence land which has been tilled but one year is better than that which has been longer under the plow. Even sod land plowed early in the fall may be used for spring planting the following year with good results.

A heavy sod in process of decay is the best source from which to obtain humus whether for bush-fruits or other crops. Unfortunately this supply is soon exhausted, as the land remains under tillage, and must be supplemented from other sources. Stable-manure used for fertilizer will help to maintain the supply but is insufficient for best results, unless used very heavily. Cover-crops have not been extensively used in bush-fruit plantations, but a

limited experience shows that they are decidedly advantageous. What the particular cover-crop shall be will always be determined by conditions. Where crimson clover thrives it is undoubtedly one of the best. For northern latitudes hairy vetch is more dependable. Rye should be avoided for, unless uprooted at just the right moment in spring, it so quickly saps moisture from the ground that the crop may suffer much. Its growth in spring is so rapid that a very little delay caused by unfavorable weather or any one of the many things which are always hindering in farm work may cause serious injury.[1]

Soil acidity may have considerable influence on results. Its effects differ greatly with the different types of fruit. The red raspberry is impatient with an acid soil and will respond well to an application of lime. The black-cap is not sensitive to acidity. It may even object to too heavy applications of lime. Blackberries are comparatively indifferent, but may be helped some by lime if the soil is very sour. Currants and gooseberries appear to behave in much the same way, being somewhat benefited when the soil is very sour. Huckleberries, on the other hand, demand a sour soil and will only thrive when it is present.

Thorough preparation of the soil is essential, especially deep plowing, with a good plow which will thoroughly pulverize the soil. One should remember that he is to plow but once and the crop lasts long; therefore, the work should be thorough. Subsoiling may be advantageous under exceptional conditions, but under those conditions underdraining will probably be better. Dynamiting, de-

[1] For a fuller discussion of cover-crops in their relation to fruit-growing, see Bailey's "Principles of Fruit-growing," Revised Ed.

signed to accomplish the same object, is more in use at present, but apparently no more likely to prove generally beneficial.

FERTILIZERS

Few definite results seem to be available showing what fertilizers to use. In fact definite results with fertilizers are not easily obtained anywhere, and when gotten may be of very indefinite value under conditions differing from those of the experiment. A knowledge and application of the general principles of plant feeding are much more valuable than any specific directions or rules. Stable-manure is a safe material to use where available, unless it be on moist fertile soil where there is a tendency to rank and tender growth of canes. If supplemented with mineral elements, the results are likely to be better. Basic slag is undoubtedly one of the best sources of phosphoric acid. Wood-ashes form an ideal source of potash, but are so seldom available that muriate of potash is much oftener used, 100 pounds to the acre being sufficient. Stable-manure is best applied in fall or winter, so that it may become available for early spring growth and not foster a late fall growth which may lead to winter-killing.

Leguminous cover-crops, if used, may furnish all the nitrogen needed under many conditions. If it becomes necessary to supply this element in the form of chemicals, it can be obtained from nitrate of soda or dried blood. One hundred pounds of the former or 125 pounds of the latter, to the acre, will be ample under average conditions. Voorhees [1] recommends a basic formula consisting of 150

[1] "Fertilizers," Revised Ed., p. 313.

pounds of ground bone and 100 pounds of muriate of potash, to be supplemented with nitrogen as needed.

SUGGESTIONS ON PLANTING

Planting may be done in spring or fall. Each time has its advantages. In fall planting the work can be conducted more leisurely and when the ground is in the right condition. In spring there is always a rush of work and often the ground is too wet to work well until the season is late. If mulched with manure or earth, fall-set plants will generally go through the winter in safety. When spring opens such a plant is ready to beign growth at once. In regions of excessive or deficient rainfall, fall planting is less likely to succeed. In the one case plants are often lifted by heaving; in the other they may suffer from winter drought. Spring planting, if done early and under proper conditions, is always safe and often best. It is particularly best for black-caps and dewberries. A point worth remembering is that the soil is much more easily worked following spring planting than following fall planting. This may materially affect the cost of the first season's care. Currants and gooseberries begin growth so early that it is more difficult to get them in on time. The young shoots which spring up from black raspberry tips are very tender and easily broken when started, hence late spring planting should be avoided.

For increasing a stock of red raspberries or blackberries on one's own grounds, young shoots of the present season's growth may be used with good results. Transplant them like cabbage plants any time after they are four

inches high. If much taller than this cut off the tops. They should be well established by fall. All plants, and especially red raspberries and blackberries, should be carefully lifted. If carelessly pulled up, the plant is likely to break at the connection with the root from which it springs, leaving only a straight cane, with very few roots attached.

The individuality of the parent plant is worth considering when it is feasible to do so. Plants of the same variety may vary widely in productiveness and size of fruit. It is reasonable to expect some of these differences to reappear in the offspring. This point has doubtless been over-emphasized in some cases. Great claims have sometimes been made for so-called "pedigree" plants. Heredity through mere division of the parent plant does not operate in the same way as it does in sexual reproduction of animal life. Many of the differences which appear in plants of the same variety are due to different conditions to which the plant may have been subjected, and may not reappear in the young plants taken from it. Yet every practical grower would rather have a strong, thrifty plant, from a vigorous and productive parent, than the opposite. Vigor and thrift are essential. "Pedigree" other than this is of doubtful value.

Six feet apart is a common and convenient distance for bush-fruit rows, with plants two to three feet apart in the rows. Under some conditions check-rows may be preferable, since their use reduces the amount of hand work needed to keep the plantation clean. In that case plants may be put four to five feet apart each way. Blackberries and red raspberries, owing to their suckering habit, natu-

rally form hedge-rows. These are inconvenient to keep clean, but produce more fruit than the smaller number of plants which will be left in hills. Currants and gooseberries adapt themselves readily to hill culture, in fields of sufficient size. In dry climates plants should be farther apart than where moisture is more abundant. Too close planting in a moist climate, especially in a sheltered location where the wind cannot have free play, may favor the spread of fungous diseases. When rows are placed six feet apart, it may sometimes be worth while to set the plants four feet apart in the rows and line them the opposite way so that the rows may be crossed with horse and cultivator when the plants are small and when the old canes are first removed after fruiting.

If plants are received from a distance, the sooner they can be set the better, but if conditions are unfavorable it is better to wait. Heeling-in is a simple process, and if carefully done the plants may be safely kept for some time. In the shade of a building is a good place to do this. A shallow trench should be opened, with one side slightly slanting. Loosen the bunches enough so that the roots may all come in contact with the earth, then lay them against the slanting side and cover the roots carefully, pressing the earth firmly about them. Tier after tier may be packed in this way. If too dry when received, placing the plants in water or covering them entirely with earth for a time will help them to recover.

The most convenient method of planting is to throw out good deep furrows with a plow. If the plants are to be set in check-rows, the field should first be marked at right angles to the furrows. It is the practice of some growers

to use stakes for all such furrowing out. At least three are needed, one for either end and one between. Care must be taken to see that these are set in perfect range to begin with. Notches are cut on each to give the correct distance apart for the rows. Starting at the first stake a mark is made in the soil and the stake moved to the place for the next row. The driver should then step between the heads of the team, taking each horse by the bit and walking between them, keeping his eye constantly on the two stakes ahead and in exact range with them. A man behind keeps the plow following in his footsteps. Before the middle stake is reached one should try to catch some object in the distance, by which to keep the proper range from that point to the end of the row, after moving this stake to the next row. When the end is reached a mark is made for the starting point of the second row and the stake set for the third one. It is ordinarily better to return in the same furrow, for by going twice in the same row the soil is turned out in both directions and left in a finer and better condition for covering the plants. It is often possible also to correct irregularities of the furrow caused by stones throwing the plow to one side or from other reasons. Another advantage is that in going but once in a furrow, with these turned in opposite directions, the alternate spaces are likely to differ in width. If it seems desirable to have a straight landside to the furrow, against which to place the plants in setting, the plow should pass through but once. In that case it is often better to furrow but one way, driving back each time without plowing a furrow. With a well-trained team, a good driver can make the furrows very straight alone,

but it is more convenient to let one man attend to the plow while another leads the team.

If the soil is deep, it may be well to make the furrows deep and set the plants well below the surface, only partially filling in the furrow at the time of planting. It is sometimes thought that plants so set are better able to withstand drought and will stand up better. That depends much on soil conditions. If the subsoil is hard and unfavorable for root-growth, and the surface soil shallow, deep planting will not be wise.

In well-prepared ground, with the furrows deep enough, the plants are quickly set with the hands alone, drawing the earth over the roots and firming it well, but leaving much of the furrow to be filled in with a hoe or by the subsequent cultivation. It is best to carry small plants of this kind in water, from which they are removed only as set. If several persons are at work, one may carry and drop the plants while the others set. The plants should be dropped no faster than they are set. If one person is working alone, the plants may be carried in a pail partially filled with water from which they are removed as needed.

MANAGEMENT OF THE LAND

Bush-fruits will not fully occupy the soil the first year. Intercropping is, therefore, permissible. With rows six feet apart a row of almost any tilled crop may be placed between. Even strawberries may be used, though these are less desirable because remaining until the second year. The advisability of intercropping depends much on the

fertility of the soil and the methods of the grower. Sometimes it is wise, sometimes unwise.

The first year's cultivation is simple. The same care which any other hoed crop should receive will suffice. The better the tillage, the better the growth; the more complete the dust mulch, the more moisture will be conserved.

The tillage of succeeding years is not so simple. Many soils become very hard when not plowed, and weeds soon gain a foothold. Here is a case where the proverbial "stitch in time" is especially important. But even with the best of intentions the stitch will sometimes be dropped. Frost leaves the ground in excellent condition in spring, loose and easily tilled. If the cultivator and hoes can be started at once, and kept going, all will go well. Unfortunately this soil condition is altogether too brief. Spring rains, winds and sun soon change it. Often the ground is not dry enough to work before the change has taken place. Any good cultivator will do the work if it can be started in time, but if delayed too long even a plow may be necessary. This is undesirable, for even as shallow a furrow as can be turned is likely to prove injurious, especially among the groselles, where deep cultivation is always to be avoided. The use of cover-crops may necessitate more vigorous methods in the spring cultivation than would be needed otherwise. In soils which are easily worked, a scuffle hoe may do the work among the plants more rapidly than an ordinary hoe.

Maturity of cane and winter hardiness do not seem to be coördinate among bush-fruits. Hence the common advice to cease tillage in midsummer in order to ripen

wood-growth is at least open to question. Canes which spring up late in the season, and which apparently go into winter immature, will often come through green to the tip, while large and apparently mature canes will be seriously injured. Much depends on climate, locality and season. In semi-arid climates, like that of the plains, there is little danger of inducing too late fall growth by continuous tillage. Lack of soil moisture is a greater menace. Plants there often suffer from winter drought. The writer found that continuous cultivation gave good results in Nebraska. Some definite, careful experimentation is needed to determine what conditions and methods of treatment are needed to insure least injury in winter.

Mulching to replace tillage is often suggested. It is a practice which is to be commended under some conditions, but those conditions are exceptional rather than general. It is especially adapted to moist soils in regions of abundant rainfall. In the home-garden, where the plot may be small and inconvenient to cultivate or where there is no horse available with which to do the work, it may be the best plan. In field culture the soil mulch is generally the best. On any large scale, mulching is expensive. It is often difficult to obtain material and it takes time to apply it. Mulching is thought to induce surface rooting of the plants. Such roots may be quickly injured if the mulch is allowed to disappear, and may suffer more in time of severe drought. It is thought that its practice will give more satisfactory results with currants and gooseberries than with other bush-fruits. Their rooting habit seems to be shallow and they are easily injured by deep cultivation.

Some commercial growers owning rich soils in moist climates have found mulching desirable, especially in the later years of a plantation's life. The mulch is usually obtained by seeding the land to clover, which is mowed and left on the ground. A practice at one time, and perhaps still in use, was to grow clover on other land, to be cut and spread along the rows, tillage being kept up in the spaces between.

TILLAGE TOOLS

Few special tools are needed in the bush-fruit plantation. The cultivator is the most important implement. Any kind which will thoroughly loosen the soil and leave the surface level will answer the purpose. It should be one which will do good work when widely spread. With full-grown bushes it is impossible to do good work except with a wide tool which can run beneath the branches. For suckering varieties, a tool with teeth which are square on the end is desirable. Such teeth will cut many suckers beneath the surface where ordinary teeth will dodge them. They are also useful in cutting off Canada thistles and other deep-rooted plants which often escape. In soil which is free from stones it is possible to use knives or cutting blades of steel which can be made by a blacksmith and attached to an ordinary cultivator.

For working under large and spreading plants, the scuffle hoe, already mentioned, is a useful tool. Those on the market, especially the crescent scuffle hoe, answer the purpose well. A home-made device, designed for a similar purpose is illustrated in Fig. 1. It was made by

riveting a piece of heavy scythe to the outer tines of an old fork.

Two devices for the horse which does the cultivating are worth mentioning in this connection. One is a wire muzzle which can be slipped over the nose and buckled to the bit-ring. Most horses are fond of the canes and will be constantly nipping them, both to the detriment of the plants and of their work. This device will prevent that. Tying an old grain-sack with the bottom cut off over the nose will accomplish the same object but is rather uncomfortable for the horse in warm weather.

Fig. 1. Home-made scarifer or scraper.

A leather apron to protect his breast from the thorns is also a good thing to use. The horse needs to be kept close to one row so that the cultivator will reach under the bushes, and this apron will make it easier to keep him there.

PRUNING

The old canes of raspberries and blackberries are best removed and burned as soon as fruiting is over. Any insects which may be at work in them are thus destroyed. The canes can be more easily cut at that time, also, for they are still soft, while by spring they become dry and woody. Removing the canes at this time also offers a good opportunity to clean up the plantation and cultivate close to the bushes. The fruiting habit of the groselles is

different from that of the brambles, since the branches live from year to year. Yet a somewhat similar principle of renewing the fruiting wood may be followed with advantage. Young wood bears the finest and largest fruit. Hence it is better to cut out the older wood from year to year, allowing the younger shoots to take its place. This is better than cutting off the ends of the shoots, for that induces additional branching, with a dense top-heavy growth.

Different implements are used for cutting out the old wood. For currants and gooseberries, long-handled pruning-shears are probably best. For brambles, when the canes are still green, a bush-scythe, corn-cutter or some form of hooked knife in a long handle is more convenient. A good tool of this kind can be made from a flat file, bent and flattened, then driven into a shovel or manure-fork handle, as shown in Fig. 2. The heel of an old scythe can be used for a similar purpose. A spud similar to that shown in Fig. 3 is sometimes useful in cutting out young canes or in cutting off young suckers. It may also be used in putting down tips of black raspberries.

Fig. 2. Pruning-hook.

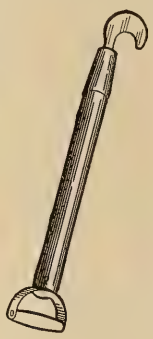

Fig. 3. Pruning-spud.

A special rake for gathering up the prunings has been recommended by some growers. It consists of a head-piece of 4 x 4 timber, about 5 feet long. Into this are fastened seven teeth of ¾-inch round iron, 18 inches

long. Poles at right angles to the teeth serve for shafts and a bow is attached to the head-piece for handling it. By means of such a tool the canes can readily be gathered into piles in the rows, from whence they can be loaded on a hay-rack and drawn away. Gathering them by hand is slow and expensive work.

For the spring pruning of brambles, which consists chiefly of cutting back the laterals, light, quick and easy-working shears are needed. If the canes are not too large and dry, a pair of sheep-shears works well. For nipping back the new growth in summer a long-bladed knife or sickle with a keen edge will be found convenient, especially on young bushes. On older plants these new shoots are shielded by the older canes so that they are not so readily reached with a stroke of the knife. Sheep-shears or the thumb and finger are better under those conditions.

It is best to go over the plantation at several different times if the pinching-back plan is followed. This ought to be done when the shoots reach the right height. If allowed to grow taller, then cut back, the laterals do not push forth so vigorously. If only the tip is removed from a tall shoot, the result will be a top-heavy bush which will not hold up its fruit well.[1]

STAKING AND TRELLISING

Many home growers, and in some localities even commercial growers, believe it profitable to use stakes or trellises of some sort to support the plants of different

[1] For full discussion of the principles and practice of pruning, consult "The Pruning-Manual" by L. H. Bailey.

brambles. With dewberries this is almost essential if cultivation is to be given. With the other kinds it is sometimes desirable. Various methods are employed. When the plants are grown in hills a stake at each hill, to which the canes are loosely tied, is the plan followed. If grown in hedge-rows, posts are set along the row, to which one or more wires are fastened. If a single wire is used, the canes are tied to this. Another plan, which does away with the labor of tying, is to nail cross-pieces to these posts and fasten two wires to these pieces, about eighteen inches apart. The shoots are allowed to grow up between the two wires and are supported by them as they droop outward. The height of these wires should be such as to bring them about to the branching-point of the canes. A method in vogue in the Hudson River Valley, as described later, is to hinge this trellis to short posts in the ground, supporting it by braces, so that the whole can be laid upon the ground and the plants covered for winter protection. Trellising methods are shown in Plates I and V.

WINTER-KILLING

The hardiness of the varieties which he cultivates is a point of great importance to the grower. To determine what constitutes hardiness is not easy. Neither is it definitely known what method of treatment is best adapted to prevent winter injury. Conditions of season and of growth undoubtedly affect the result in great measure. Disease or excessive summer heat may so weaken plants that they are unable to withstand the most favorable winter. Strong healthy plants, on the other hand, will

often endure the most trying winters unhurt. Raspberry plants which the writer once removed to a forcing-house in the fall of the year showed all the ordinary symptoms of winter-killing, when starting into growth under glass. Yet these plants had experienced little cold; just enough so that a ball of earth could be taken up and moved with them to the house.

A current belief is that plants endure the winter better after a comparatively dry fall, favoring a slow, well-ripened growth of wood. The validity of this theory is not established, for slender canes, produced during the latter part of the season, often winter-kill less than those of the whole season's growth. This fact does not warrant the assertion that immature canes are hardier, for canes produced late are smaller, and may make firmer and better wood than those of earlier and more vigorous growth. Some successful berry-growers follow a practice directly opposed to this theory, for they believe in thorough and frequent cultivation up to the time of frost. This favors a late fall growth, producing some wood, at least, which cannot be well ripened when winter sets in.

Winter protection is an essential feature of berry-growing in many localities. Many growers find the practice profitable even where it is not essential. The increased yield, even in mild climates, may more than repay the cost of protection. A crop of fruit is thereby assured, even though the winter prove an unusually trying one.

Different methods are employed for laying-down the canes. A wagon is sometimes driven over the rows so that the axle shall bend the plants all in one direction. If mulch of any kind is used for covering, it may be loaded

on the wagon and applied at the same time. A part of the row is sometimes bent over with a fence-rail, which is left on the plants to hold them down.

A simple and practical method followed in Minnesota, where protection is essential, is described by Kirkpatrick [1] as follows:

"Two men are required to do the work rightly. Facing to the north end of the row, one takes a spading-forkful of earth from the north side of the hill. The other man, with an ordinary pitchfork, pushes the canes to the ground. Planting the foot against the base of the canes and pushing at the same time is advised. This causes most of the bending to occur in the root, and often prevents breaking the cane. When bent, the canes are pinned down with the pitchfork while the other man throws on them a few forkfuls of soil, to hold them in place. Later, a complete covering with soil, to a depth of three or four inches, should be made. . . . Two men can do the work well and rapidly. Trash or weeds mixed with this covering, or under it, are not desirable; for they afford a harboring-place for mice, which may injure the canes.

"A machine requiring four horses has been planned to do this work. While it covers them nicely, it has the fault of breaking very many canes, and for that reason is not extensively used.

"The covering should be removed with a round-tined fork in the spring, when the ground has become dry and settled. Some of the earth is scratched off, and the canes lifted to a slanting position with the fork. Many growers leave the canes slanting as far as possible, and believe it

[1] Minnesota Farmers' Library, Extension Bulletin No. 16.

beneficial; otherwise they are carefully drawn up and tied or supported, as before directed. The earth used for covering is worked back into its original position by the first cultivation.

"The work of laying down can be done at any time after growth stops in the fall, but before the ground freezes. It may even be done while the plants are yet in full leaf, without injury, if conditions are favorable, but this is not to be recommended. The time of lifting them in spring is of greater importance. A plant which has been covered during the winter is much more tender than one which has been exposed to the weather. If lifted too early, and severe weather follows, they are likely to suffer even more than if left exposed during the entire winter. If left too late, growth may begin while they are still covered, rendering them sensitive to even light frosts when exposed. A few days of mild weather following the uncovering is desirable. The cost of this protection is not excessive. In Wisconsin, where much of it is done, the cost of laying-down blackberries and lifting them again in spring has been estimated at about $5 an acre."

Bailey writes[1] as follows on this subject: "Blackberries and raspberries are extensively laid down in cold climates, and it may be well to relate the method here for the benefit of those who occupy bleak locations. Late in fall, the bushes are tipped over and covered. Three men are generally employed to perform this labor. One man goes ahead with a long-handled round-pointed shovel and digs the earth away six inches deep from under the roots. The second man has a six-tined or four-tined fork which he

[1] "Principles of Fruit-Growing," Revised Ed., p. 257.

thrusts against the plant a foot or so above the ground, and by pushing on the fork and stamping against the roots with the foot, the plant is laid over in the direction from which the earth was removed. The third man now covers the plant with earth or marsh hay. Earth is mostly used, and if the variety is tender the whole bush is covered two or three inches deep. Hardy varieties may be held down by throwing a few shovelfuls of earth on the tops of the canes, thus allowing the snow to fill in amongst the tops. If the grower lives in a locality where late spring frosts are not feared, the bushes should be raised early in the spring; but if frosts are anticipated, they may be left under cover until corn-planting time. If the buds become large and are bleached white under cover, they will suffer when exposed to the atmosphere; and one must watch the bushes in spring, and raise them before the growth starts. This method of laying down blackberry plants costs less than $15 an acre, and the slight breaking of the roots is no disadvantage. Some growers dig the earth away on both sides of the row, and still others bend over the canes without any digging. Whatever method is employed, the operator must be careful not to crack or split the canes. The method may be varied with different varieties, for some bear stiffer canes than others."

The same author writes[1] again as follows: "The tops of plants may be laid down for the winter. Fig. 4 shows a method of laying down blackberries as practiced in the Hudson River Valley. The plants were tied to a trellis, as the method is in that country, two wires having

[1] "Manual of Gardening," p. 138.

been run on either side of the row. The posts are hinged by a pivot to a short post, and are held in position by a brace. The entire trellis is then laid down upon the approach of winter, as shown in the illustration. The blackberry tops are so strong that they hold the wires up from the ground, even when the trellis is laid down. To hold the wires close to the earth, stakes are thrust over them in a slanting position. The snow that drifts through the plants ordinarily affords sufficient protection for plants which are as hardy as grapes and berries. In fact, the plants may be uninjured even without cover, since, in their prostrate position, they escape the cold and drying winds."

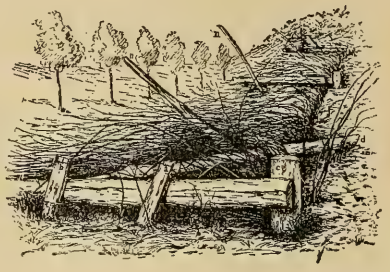

Fig. 4. Laying down trellis-grown blackberries.

Severe cold is not the only cause of winter-killing. Other weather conditions play an important part. In Nebraska, red raspberries and blackberries are commonly killed to the ground if left unprotected, and black-caps fare only slightly better. Yet the climate is no colder than in New York or Pennsylvania, where protection is rarely given. During one winter in Nebraska, the mercury fell below zero but once, and then only five degrees below, yet unprotected canes were entirely killed. Young plants of Taylor blackberry were uniformly killed to the ground during that winter. Plants in adjoining rows, of the same age and similar in other respects, were laid down and cov-

ered. These came through in perfect condition, green to the tips.

The following winter was much colder, but the preceding summer and autumn were favorable, with plenty of rain. The plants, therefore, went into winter quarters with a good supply of moisture in the ground. Both raspberry and blackberry plants came through that winter in good condition without protection, although much lower temperatures prevailed than during the preceding winter. Drought is more disastrous than cold in Nebraska. Excessive, as well as deficient moisture, may contribute to winter injury. In the moist climate of the New England coast, where moisture is seldom deficient, and usually excessive, winter-killing is likewise common.

PROPAGATION [1]

The ordinary methods of propagation are simple, consisting in some form of division or continuation of the parent plant. Tips, suckers, or cuttings are used, according to the habit of the species. These methods will be discussed later under each individual fruit.

Reproduction from seeds must be employed if new varieties are to be obtained. This does not concern the practical grower, but for the benefit of the inexperienced devotee of these fruits, who may wish to try his luck in this lottery of reproduction, a method of handling is here given. Growing plants from seeds is a slow process, and in most cases the offspring will show no qualities superior

[1] For extended discussions of propagation of plants, see Bailey, "The Nursery-Book."

to the parent, or to other varieties already in cultivation.

When the fruit is thoroughly ripe the seeds should be washed out of the pulp in water, and may then be sown at once, or first dried, like other seeds, and sown later. There is reason to believe that a larger proportion of the seeds will germinate the first spring after sowing if put in the soil at once, than if dried and kept some time before sowing. By the latter method most of them remain dormant during one whole season, germinating the second spring. Unless they are to be sown in very large quantities, gardeners' flats, about two feet square and five or six inches deep, will be found most convenient. The soil used should be rather light and porous, one which will not bake nor pack hard. The seed may be sown in rows two or three inches apart, or broadcast over the surface of the ground. Cover lightly, about one-fourth of an inch deep. The boxes can then be put outside in a protected, shady place, and left till the seeds germinate. If the seeds are the product of crosses or particularly choice selections, so that they need to be kept pure, the flat should be covered with a fine screen to prevent the possibility of birds dropping other seeds into the same box, as might easily happen, especially if the box has been placed under trees to secure the desired shade. The only attention required from this time on is to see that the soil is not allowed to dry out enough to injure the germinating power of the seeds. Weeds should also be pulled out as they appear. As soon as the plants are strong enough to bear handling, they should be potted off or reset in other flats, putting them two or three inches apart each way.

The flats or pots in which these young plants are growing should be well plunged in the soil to avoid drying out. This is of especial importance in getting the plants through the winter safely, for lack of moisture in winter is as destructive to plant life as lack of moisture in summer. After one season's growth the plants may be strong enough to be set in the open ground, but they need mellow, well-prepared soil and careful attention, for most of them will still be small and weak.

THINNING THE FRUIT

Thinning is essential with all fruits, at times, if best results are to be secured. Berries may be thinned by clipping off clusters or portions of clusters, but such a process is of interest only to the novice, or to the exhibitor, who may wish a few unusually fine specimens. Thinning is of importance to the commercial grower, but he accomplishes his object in a much simpler way. His thinning is done at the annual spring pruning, by leaving more or less fruit-bearing wood. This is important and should be kept constantly in mind at the time of pruning. Judgment and experience are both essential if the work is to be properly done. If the right amount of wood is left, no further thinning will be needed.

FORCING BUSH-FRUITS

The wealthy grower, who wishes to procure things out of season, regardless of cost, will find it possible to grow bush-fruits under glass if he wishes to do so. Young plants of raspberries and blackberries can be started in

boxes or large pots early in spring in order to become well established before fall. At any time after freezing weather has come they can be transferred to the forcing-house. A limited trial made some years ago indicated that a comparatively high temperature and artificial pollination are essential.

SUGGESTIONS ON PICKING

Picking should not be done when the fruit is wet, if it is possible to avoid it. Wet fruit will mold quickly, especially in damp weather, and is likely to reach the consumer in very bad condition. The filled baskets should not be allowed to stand in the sun. Gooseberries especially, are very quickly injured. Exposure to the sun even for a short time on a hot day will change their color, giving them a cooked appearance and seriously injuring their market qualities. The baskets should be promptly taken to a cool shady place, and from there to the market and the consumer, with the least possible delay. Free access of air is usually considered important, but if the fruit is perfectly dry when picked, and the air dry as well, this is unimportant and sometimes even undesirable. Under such conditions fruit will remain much brighter and fresher if shut up fairly close. A spring wagon of some kind is needed in hauling. What this is will depend on the amount to be handled. For large quantities bolster springs for the ordinary farm wagon, or some special form of truck wagon, will be needed. Good roads over which to travel are also a great help in getting the fruit to market in the proper condition.

Systematic records showing the number of quarts picked

by each picker are essential, with a business of any considerable extent. Several methods are in use. Perhaps the simplest is the use of printed tickets bearing numbers. These are given to the picker as the berries are brought in. These can be surrendered when the day's picking is over and the total number credited to the picker's account. These are more convenient for the grower than for the pickers, since many of them will have no convenient place to carry the tickets while at work, and some will be lost. This loss falls on the picker, since the grower can only redeem the tickets which are returned.

A method which avoids this difficulty is to use tags on which are printed numbers of various denominations. The picker's name is written on one of these cards, which is fastened to the clothing at some convenient place. When fruit is brought in the card is punched to indicate the number of quarts, the total number being credited at the end of the day, as before. The cards may be kept by the pickers as vouchers of their own, if they wish to do so.

Clean picking is an essential part of the work, but difficult to secure. There must be a careful assignment to rows and the pickers must be held rigidly to the rows given them. Even then the temptation to take the finest and most easily picked fruit from the adjoining row, when opportunity offers, may cause trouble. With a number of pickers at work, a careful foreman must be almost constantly in the field, to go over the work frequently and see that it is well done.

A simple method of holding the baskets to permit the use of both hands in picking is in common use in the berry-fields of New York state. A string or small rope, or better

yet a flat piece of tape, is run through the corners of the basket underneath the rim, then around the body and back around the outside of the basket and tied. Extra baskets are placed in this one and the outer string slipped up to hold the upper ones in place until filled. It is a very simple expedient but helps greatly in the speed of picking. Women pickers sometimes accomplish the same purpose by fastening their aprons to the basket.

Two cents a quart is the common price paid for picking berries, but this is not a fair compensation. In the best of the picking this is often more than the work is worth, while at the end of the season, when the berries are small and scattering, it is not enough. Some system of adjustment is important. Excuses multiply wonderfully as the picking begins to fail, unless this is done. Pickers disappear and the burden of this more tedious part of the work falls on the most conscientious. A stipulation that only those who continue to the end of the season shall receive two cents a quart, others one and one-half cents, helps to some extent. Perhaps a better way is to fix the price for each day's picking, according to the character of the work. Even this plan is not easily worked out, and causes some confusion. The price for red raspberries is sometimes three cents per quart.

PACKAGES AND MARKETING

The evolution of the fruit package would form an interesting study. Formerly, home-made crates were much in use. The baskets were even often purchased in the flat and nailed up at home. The manufacturer, with his

machines, now does the work so much more quickly that the grower no longer thinks of doing it at home. As the package goes with the fruit so universally, quality is of minor importance, except in so far as it may influence appearance. The standard thirty-two-quart crate is now most generally used. Baskets holding a full measure dry quart have come to be the prevailing style. It is to be hoped that the day of short baskets has gone, never to reappear. Legislative enactment in many states has helped to bring about greater uniformity. For bush-fruits, care should be taken to secure a basket which does not have too wide an opening at the corners.

Raspberries, especially the red varieties, do not carry well in large packages. Pint baskets are therefore most generally used for them, unless it be for the near-by home

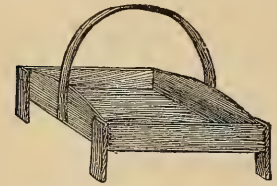

Fig. 5. Berry-stand on legs.

Fig. 6. Eight-quart picking basket.

market. Different shapes are to be secured but they are so made as to fit into the ordinary sized berry crate. Currants and gooseberries are sometimes handled in grape baskets with advantage. The demands of the particular market usually govern the choice of package.

Picking-stands or carriers, holding from four to eight quart baskets, are a necessary part of the field equipment in gathering the fruit. Different forms are in use, some

having legs and some without. For bush-fruits, the flat-bottomed picking basket holding eight quart baskets is probably as satisfactory as any. These are well-made and durable and readily obtained from the fruit package dealers.

Figs. 5 and 6 illustrate two of the most common kinds in use. Other forms are described in Bailey's "Principles of Fruit-growing."

COLD STORAGE

Berries, from their nature, are not well adapted to being kept in cold storage, yet experiments made by the United States Department of Agriculture [1] indicate that they may be kept for short periods of time with advantage under certain conditions. They may be stored until the next morning, or even for two or three days, to tide over a glutted market. Some canneries also find cold storage useful to help over the rush season. The fruit may even be stored for weeks and months for bakers' and confectioners' use by keeping it in a frozen condition.

Firm fruit of medium size, grown on soil not too moist nor too rich, keeps best. Favorable weather at ripening time also helps. The fruit should be well matured but still firm when packed, and should be handled quickly and carefully. For temporary storage a temperature of 36° to 40° Fahr. will be satisfactory, although 32° is better. If to be stored a week or more 30° to 32° is best. When frozen for long keeping 5° to 12° is usual. Such fruit is suitable for pies and similar uses. Wrapping the baskets in thin, impervious paper helps to retain the bright

[1] Bureau of Plant Industry, Bull. 108.

color of the fruit and to prevent the absorption of storage-house odors and the appearance of mold. Red raspberries may be kept two or three days, black raspberries three to five days, blackberries seven to ten days and currants two to three weeks. When removed from storage raspberries begin to break down in ten to twelve hours, currants not quite so quickly.

METHODS OF CROSSING BERRIES

The history of horticulture is conspicuous evidence of the fact that careful, systematic plant-breeding has played but a small part in its development. Animal-breeders have long recognized the necessity of working along definite lines, with clear-cut aims in view. Horticulturists have for the most part been content to take what they found, and wait for something better. In the history of American varieties of fruits, such phrases as "a chance seedling," "found growing," and the like, are of very common occurrence. There is good reason for this in the fact that the rewards for systematic work in plant-breeding have not been sufficient to repay the effort. Results are uncertain, and often disappointing. If successful the world reaps the benefit, rather than the breeder. Yet there is no other way to make sure and definite progress. The more definite the aim, and the more clearly the scientific principles underlying the problems of plant-breeding are kept in mind, the more certain will be the results.[1]

[1] These principles are fully discussed in Bailey's "Plant-Breeding;" latest edition is by Bailey & Gilbert.

The terms crossing and hybridizing may sound very scientific to the novitiate, and he may think that the operations lie within a field beyond his reach. Yet there is nothing particularly difficult about the operation. It is, for the most part, slow and delicate work, and requires great care to insure purity of results, if an accurate record of what is accomplished is desired. We have no right to assert that a plant is a cross unless we know beyond question that no other pollen than that of a given parent reached the stigma of the flower from which the seed was developed. The mere fact that pollen of a given variety has been applied to the stigma of another variety is no evidence that crossing has taken place.

The methods of crossing vary with the character and structure of the flower in question, but the essential feature is the same in all cases. The pollen of the flower which is to serve as the female parent must be carefully and completely removed before it ripens, then the flower must be carefully covered until the stigma is ready to receive pollen and admit of fecundation. The flowers of the male parent should also be carefully covered before opening, to prevent the admixture of pollen from any other plants. At the proper time this pollen is conveyed to the stigma of the protected flower on the female plant, and the flower again covered until it has reached such a stage that fecundation is no longer possible. If properly fertilized by the pollen applied, the stigma very soon withers, but if not, it may remain in a receptive condition for several days.

In crossing brambles or groselles, select a cluster which has several buds nearly ready to open, if such a one is to

be found. Cut off all younger buds, all which have already begun to open, all flowers and all fruit which has already set, leaving only the few unopened buds which are of about the same age. The next step is to remove all stamens from these buds. As the number of stamens is large, to remove each one separately would be a tedious task. Fortunately, in the rose and saxifrage families, to which these fruits belong, the stamens are borne on the calyx. This enables us to get rid of them all by simply cutting away the calyx. This can be conveniently done either with fine, sharp-pointed scissors, or with a spatula made from a pin stuck in the end of a stick, then flattened and sharpened at the edges. Turn the bud (Fig. 7) bottom side up, and cut a circle around the stem not far from it. The whole calyx will then come away, taking the stamens with it. After all the buds have been thus treated, care being taken that no anthers are left, the cluster is covered with a paper sack. Half or quarter-pound grocers' sacks answer the purpose well. If the open end of the bag is moistened, the paper can be pressed more closely about the stem. Some flat material is best for tying, raffia being most convenient if at hand. One or more clusters on the variety which is to be used as the male parent should be covered in the same way, in order to have pure pollen to apply at the right time. When first emasculated, a raspberry bud will have much the appearance shown at left in Fig. 8, but usually in about two days, in warm weather, it will have developed far enough to be ready for pollination. It will then have the appearance

Fig. 7. Raspberry bud ready to emasculate.

seen at the center in Fig. 8; the styles will be extended and spreading, and the stigmas will have a sticky look, indicating that they are in a receptive condition. Blackberries often require several days to sufficiently develop after emasculation, especially late in the season, if the weather is cool.

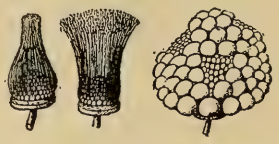

Fig. 8. Raspberry crossing. Left, emasculated bud. Center, ready to pollinate. Right, result of incomplete fecundation.

When the stigmas are ready, uncover the cluster from which the pollen is to be obtained, select a blossom from which it dusts out freely, and apply it to the ones to be fertilized. The pollen may be collected and applied with a spatula or camel's-hair brush, but if in the right condition, applying the flower direct is the simplest way. The pollinated cluster must then be at once covered, as before, and left for a week or ten days. At the end of that time, if all the stigmas have shriveled away, the paper sack may be replaced by one of mosquito netting, which will admit light and air, but still protect the fruit from birds and boys.

In case of the brambles, the result will often be an imperfect berry. Only a few of the akenes are likely to be fecundated, and there may not be enough to fill out all the space on the receptacle. Such a fruit is shown at the right in Fig. 8. When the fruit is ripe the seeds should be planted and cared for as heretofore directed for growing plants from seed, except that especial care should be used in all the operations to avoid mixture, or injury to seeds, or young plants. Crossing requires much time, and accidents

are liable to occur all along the line, so that the result of a summer's work may be, in the end, only a few plants, most or all of which are worthless. Yet persistent effort in this line should be encouraged, and in time the results are likely to repay all the attempts made.

While located in Rhode Island, the writer grew many raspberry seedlings which were obtained by definite methods of crossing. He found that as a rule the seedlings of a given cross showed well-defined tendencies in certain directions. The greater number resembled each other rather closely. They were usually intermediate in character between the two parents, some more closely resembling one parent and some the other. Here and there a plant would show enough variation to be worthy of note. Of the hundreds grown only a very few gave sufficient promise to make their further propagation seem desirable. Yet this is just the line which must be followed if real progress is to be made. It is not the kind of work to bring popular approval or upon which claims for increased appropriations can safely be based. It should be undertaken only by those who have persistency of purpose and who can hope to continue it for many years. Long-continued effort, wisely applied, building upon what has already been accomplished, will in time bring results of real value, but is not likely to win much loud acclaim for the worker. He must be content to discard hundreds of his productions, for each one of value. It requires courage to do this. Each seedling is a distinct variety and the one plant the only one of its kind in existence.

Work in breeding raspberries has been carried on for a number of years at the Geneva, New York, Experiment

station with interesting results. A number of valuable varieties have also been secured. Their work has established beyond question the hybrid origin of the purple-cane type, *Rubus neglectus*. Pure seedlings of Columbian, a variety of this class, reproduced the characters of the parent much more nearly than was to have been expected. All were purple in color and none propagated by suckers. In hybrids produced by crossing two black-caps with a red raspberry the seedlings in one case were all purple, while in the other, 10 yellows appeared among the 289 seedlings. Color is apparently a Mendellian character. Some varieties of black-caps are evidently pure black, while others carry yellow as a recessive character. The same principle seems to hold with red varieties also. A number of seedlings of Cumberland were strictly dwarf in character. These were quite different from normal plants which lacked vigor. The nodes were as numerous as usual but many of them were much shorter, sometimes not over a quarter of an inch long. Many of the leaves were small and easily broken from the stem and the canes were thickly covered with soft spines. Many of these dwarfs were less than a foot in height and the tallest were not over two feet.

A correlation appears to exist between leaf and fruit color. Red and purple sorts have a tinge of red on the leaves and young canes, which is entirely lacking in yellow varieties.

Hybrids were produced by crossing a red raspberry and a blackberry with *Rubus odoratus*. The resulting seedlings from the blackberry were lacking in vigor and soon died. Those from the raspberry, however, grew well

and bloomed freely, their characters leaving no doubt as to their hybrid origin. The experiments are reported in Bulletin 417 of the Experiment Station, Geneva, N. Y., to which the reader is referred for a full account of the results.

Valuable work has also been done at the South Dakota Experiment Station in breeding varieties which will endure the climate of the northern Plains region. Such lines of work are to be commended, for the grower soon learns that among the factors which make for success in his undertaking, the adaptability of the varieties which he plants is of primary importance.

PART II

THE BRAMBLES

CHAPTER II

THE RED RASPBERRIES

THREE types of fruit are included in this discussion of the red raspberry—the foreign or European class, the true American reds, and the hybrid or purple-cane group. These types are not clearly defined. The American and European types are very similar in many respects, while the hybrid type includes varieties of nearly all gradations between the reds and the black-caps. Typical varieties of the first class are Antwerp and Fontenay, of the second, Cuthbert, and of the third Shaffer and Columbian.

SOIL

The red raspberry is not fastidious as regards soils. It can be made to thrive on almost any average land, though extremes of any kind are naturally to be avoided. An upland, sandy, or clay loam will prove satisfactory if well drained. The impression has been general that the lighter loams are best, but Wilson found in a study of the raspberry industry of New York [1] that plantations on

[1] Cornell Reading-Courses, Vol. II, No. 36.

clay loam, although not as numerous as those on other soils, gave the heavier yields.

The moisture-content is more important than the character of the soil itself. Wet land will insure partial failure at least. On such land the plants will often heave badly and suffer much from winter-killing. The growth is generally feeble and the outcome unsatisfactory. Yet no fruit suffers more quickly from drought at ripening time. The demand is, therefore, for a soil which is well drained, so that it is never surfeited with water, but it must also be retentive of moisture so as to supply the plant's needs during the growing season. A liberal supply of humus is a great aid in this respect.

A reasonably fertile soil is desirable. The commercial grower is not likely to be troubled by too much fertility in his soil. In the home-garden, however, a patch of ground may sometimes be chosen which is too rich for best results. Ground which has been manured heavily, year after year, or which receives the wash from a barn-yard, may contain too much nitrogen. Under these conditions the growth will be rank and the canes tender. Excessive winter injury and diminished fruitfulness are the natural results. Vigorous growing varieties may thrive better on infertile soils than varieties of weaker growth.

THE SITE AND EXPOSURE

The cooler and shadier the spot, the finer the berries. This holds true with wild and cultivated berries alike. If a choice is available, a northern or northeastern exposure is therefore to be preferred, but this is not essential and

seldom figures largely in the results of a plantation. A windbreak on the side from which the prevailing winds come will assist in making conditions more favorable. These considerations are much more important in the mid-continental regions, which are subject to excessive heat and long-continued droughts, than in more favorable localities.

Red raspberries blossom so unevenly that spring frosts are less likely to prove serious than with most other fruits. Not all of the blossoms are likely to be in condition to be injured at any one time. Elevation is therefore of less importance, and the better moisture conditions which often prevail on lowlands may make such a location preferable.

FERTILIZERS

On productive land, heavy fertilizing of red raspberries is unnecessary. Yet the following table compiled by Wilson [1] shows that under average field conditions in New York fertilizers are beneficial:

Method	*Number of farms*	*Number of acres*	*Yield per acre (quarts)*	*Income per acre*
No manure, nor commercial fertilizer	39	81	1,168	$116.69
Manure and commercial fertilizer	13	14	1,527	176.69
Commercial fertilizer only	10	30	1,439	142.85
Manure only	21	23	1,472	170.50

When both manure and commercial fertilizers were used, they were applied in alternate years. These re-

[1] Cornell Reading-Courses, Vol. II, No. 36.

sults show that the methods of fertilizing actually employed on these farms increased the yield about 311 quarts to the acre on the average, and the returns about $46.66. From this amount would need to be deducted the cost of fertilizer and value of manure, together with the cost of application and the cost of picking and marketing the additional yield, in order to show the profit obtained. The amount left would not be large. Some fields doubtless gave a profit for the materials applied and others not.

When stable-manure is readily available, it is doubtless as satisfactory a fertilizer as can be used on average soils, if applied in moderate quantities. Heavy applications may induce too much cane-growth, with poorly developed fruit-buds. A light dressing of stable-manure, supplemented with mineral elements in the form of chemicals is likely to prove most satisfactory. Little nitrogen is required. If leguminous cover-crops are used, they alone may furnish a sufficient amount. Phosphorus is needed, but not in large quantities. Potash may or may not be needed. It may be supplied in muriate or wood-ashes. Fifty pounds of muriate to the acre, annually, will generally be enough. Phosphoric acid may be supplied in basic slag, ground bone, acid phosphate or untreated rock. Ground bone furnishes some nitrogen and potash as well. It is an excellent fertilizer for all fruits, but often expensive. Judgment and caution are needed by the commercial grower in the use of fertilizers. Used wisely they may pay a handsome profit, used unwisely they may bring serious loss. He alone can determine what is best. Let him first give heed to the humus supply of his soil, its chemical needs later.

PROPAGATION

Propagation of the common varieties of red raspberries is a simple matter. Most kinds sucker so freely that the grower is more concerned with destroying the plants than with increasing them. These young plants may be taken up and re-set at almost any time during the year. In commercial work, where plants are to be shipped, the best time is early in spring. The shoots of the previous year are then moved, while they are still dormant. This should be done early for best results.

For re-setting on the home grounds, the young shoots of the current season may be lifted when six to eight inches high, and replanted much as tomato or cabbage plants are handled. With ordinary care this practice will prove entirely successful and may often give opportunity to hasten the time of starting a plantation. If plenty of plants are available so that their destruction by summer tillage is unimportant, early autumn is an excellent time to do the work, the first part of September being preferred. The plants are then mature enough to handle readily and have time to become well established before winter.

Some of the purple-cane varieties propagate by tips, after the manner of black-caps. Others, which throw up suckers, do so very sparingly. With these, root-cuttings or root injury may be needed. If a root is broken or injured, it will naturally put out a sucker at that point. Cutting or bruising the roots may therefore be desirable at times. Root-cuttings, in the manner described for blackberries, may be used. These are commonly made

in autumn. The roots are cut into pieces three or four inches long and stored for the winter in sand or moss in a cellar.

PLANTING

The general discussion regarding soil preparation and methods of planting need not be here repeated. The time of planting may vary, as above mentioned, depending on circumstances, but early spring or early autumn are generally to be preferred. The plants, whenever they are moved, should be carefully lifted from the soil, so as to carry with them some portion of the horizontal root from which they sprang. Without care in this regard many will be broken off at the point of union with the parent root. Such plants have so few lateral roots that they make a poor start.

Rows are commonly placed six feet apart, with the plants about three feet apart in the row. Some growers prefer a wider space than this, especially with vigorous varieties, on strong soil. As the plantation grows older the hedge-row widens and sometimes leaves too little room for cultivation and picking. If planted in check-rows, to be cultivated both ways, five feet apart each way is a good distance. A filler system has been suggested, where it is feasible to check-row and cultivate both ways. The idea is to set the plants twice as thick in one direction as they are to eventually remain, then tear out every other clump after two crops have been borne and cultivate both ways. The advantage would be a more complete utilization of the land at the beginning. The suckering habit of the true reds tends to develop a hedge-

row soon and care must be taken to prevent the plants from becoming so thick that they cannot do well. The cultivator must be kept running close to keep the row from getting too wide. Thinning out the plants left may also be necessary at times.

Partial shade, especially in the hot, dry climates of the West, is an advantage to these fruits. This is not easy to secure without injury from the roots of the trees which produce it. In the home-garden it may be feasible to do this at times. It may also prove desirable to plant among trees in the home-garden, even though the results are not as good as in the open. If land is limited this will make it possible to utilize it to better advantage. It may also insure better tillage for the trees than they might otherwise secure.

POLLINATION

The need of planting different varieties together to insure proper fecundation of the blossoms is a recognized factor in orchard planting. A similar need of interpollination is sometimes evident among bush-fruits. A number of varieties, both of red raspberries and blackberries, appear to be partially sterile when planted alone. The Cuthbert, our most satisfactory commercial variety, bears an abundance of pollen and is apparently fully self-fertile. Its blossoming season is also long; it is therefore an excellent sort to plant with other reds. It is always safe to plant different varieties of the same fruit near together. Nothing will be lost and much may be gained.

TILLAGE

Tillage is important, as elsewhere, to make the ground loose and friable, unlock plant-food and diminish evaporation. In the red raspberry plantation there is the additional need of destroying suckers. To this end, a cultivator with teeth square on the end instead of pointed, or with a knife attachment, as described elsewhere, is useful. This is assuming that fruit is the object. If plant-production were the aim such an implement would not be wanted.

Thorough tillage, coupled with an abundant humus supply in the soil, affords the most feasible means within the control of the grower of maintaining the moisture content of the soil during the fruiting period, when it is so much needed. These are better than irrigation, in semi-arid regions, and far more easily obtained, under most conditions. Late tillage, until time of frost, is perfectly safe with the red raspberry, and gives good results. Deep tillage is undesirable, since it breaks more roots, thus causing more suckers to spring up. A plow is sometimes used to cut down the width of the row in older plantations but is not desirable. If it becomes necessary to use it the furrows should be made as shallow as possible.

PRUNING

The pruning and training of red raspberries differs widely in different localities and among different growers. Summer pruning, consisting of pinching back the growing cane when young, to induce branching, was formerly in

use. A few growers still practice it but most commercial growers do not.

Pinching back the canes in summer seems to have a tendency to increase the number of suckers thrown up, which in itself is a disadvantage unless the plantation is being run for purposes of propagation. Unless pinched low while still very young, the plants do not throw out strong branches, like the black-caps, possibly owing to the fact that the energy of the plant is more readily directed in the line of producing suckers than in the line of developing branches. The effect of stopping the cane after it has reached a height of three feet or more, is only to force into growth lateral buds which might better remain dormant until the following spring. As a rule, they make only an imperfect development, do not become well ripened before growth stops, and are apt to be more or less injured by the following winter.

Both personal experience and the information gathered from the experience of others, leads the writer to believe that the better way to treat the red raspberry is to allow it to grow unmolested during the whole season, merely cutting the canes back to within three, or in some cases even two feet of the ground the following spring. If the canes are to be supported by stakes or trellis, as is sometimes done in garden culture, they may be left longer, say four, or even five feet. Treated in this way, the canes will throw out a sufficient number of laterals in spring to produce all the fruit which a plant ought to carry. Moreover, these branches are vigorous and healthy, and in better condition to develop a fine crop of fruit than if produced the preceding year, weakened by the winter and then

called upon to throw out fruit-bearing shoots. The lessened expense of pruning is an added advantage secured by this method of training.

An exception to this plan may be advisable in case of young and vigorous plantations, or with an unusually rampant-growing variety. Young plants have not the root development to start out so stocky a cane, and nat-

Fig. 9. A raspberry bush well trained.

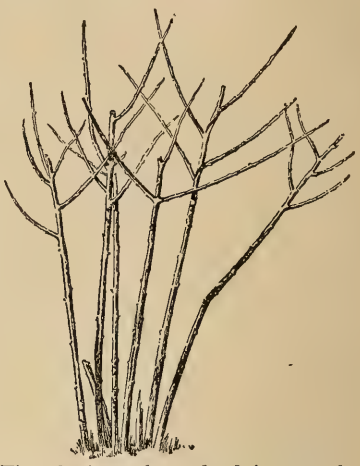

Fig. 10. A raspberry bush improperly trained.

urally produce a more slender and comparatively longer growth. Allowing such main canes to grow uninterruptedly, and cutting them back to the desired height the following spring, may remove too much of the wood, and leave only the weaker and poorly developed buds near the base. For this reason some good growers find it an advantage to pinch back the plants the first one or two years, but not after that. Whenever this is done, the

important point to remember is to merely pinch off the tip while the plants are young and only a few inches high. Six to eighteen inches is better than higher, provided it is done when the plant reaches that point, but they should never be allowed to grow higher and then be cut back to this point. If stopped at this early age, the main cane will increase in height somewhat, and will be able to throw out strong and vigorous branches, forming a stocky, self-supporting bush, well prepared to endure the winter and produce a good crop of fruit the following year. Such a bush of the Cuthbert variety is shown in Fig. 9. An undesirable form of training is shown in Fig. 10.

Staking or trellising is sometimes practiced in garden culture, and even by commercial growers, in some regions. If the hill system, with check rows, is followed, a stake is set in the center and the canes loosely tied to this. In the row method a wire is strung on posts, to which the canes are fastened. A little pamphlet entitled "New Raspberry and Blackberry Culture" by J. F. Littooy, of Everett, Washington, strongly recommends the latter plan for that region. Climate and soil fertility doubtless have much to do with the desirability of supports. In the experience of many growers in the eastern states, supports are not necessary. Where canes grow very tall and vigorous a heavier yield can doubtless be obtained by tying them up and leaving more wood at the spring pruning.

AUTUMN FRUITING

Some varieties of raspberries have a tendency to bear fruit in autumn on wood of the current season's growth.

It has been suggested that removing the regular bearing canes in spring would encourage this late-fruiting habit. A single experiment was made by the author, many years ago, on the grounds of The Cornell University Horticultural Department. Plants of Fontenay, Cuthbert and Shaffer were mowed off with a scythe in the spring, before the young canes started. The results were very definite, but not encouraging. The young canes made a vigorous growth, but not a single cluster of flowers appeared on either the Cuthbert or Shaffer plants. There were two or three fine clusters of fruit among the Fontenay plants thus treated, but this is one of the European varieties, which are characterized by more or less continuous fruiting throughout the season. Just as good clusters were to be found, and apparently as many of them, where the plants were treated in the ordinary manner.

The only advantage in autumn fruiting is the production of a small amount of fresh fruit for family use late in the season, but this trial seems to show little prospect of inducing tardy fruiting by means of encouraging a late seasonal growth.

Weather conditions appear to influence this tendency. In occasional years the wild red raspberries will bear considerable fruit in autumn. At times throughout parts of northern Pennsylvania, wild berries have even been brought into the villages for sale in October. In 1915, a very wet season, autumn fruit was abundant.

HARVESTING AND MARKETING

Red raspberries should be picked often, every other day if possible. They deteriorate rapidly after ripening, whether on the bushes or off. Being a soft berry, easily crushed and difficult to ship, they should be started on the way to market as soon as possible. The longer they remain after ripening, the softer, duller in color, and poorer in quality they become. They are best marketed in pint baskets, though the quart basket is often used. The pint baskets are oblong in shape and the size is such that the ordinary bushel crate will hold sixty of them. Settling and crushing from the weight of the fruit itself is largely avoided and the fruit reaches the consumer in much better condition than when marketed in larger baskets. The fruit should not be picked when wet and should be kept in a cool well-ventilated place until sent away. A home market is best, and except in localities where they are largely grown, is usually at hand. The fruit seems to be a universal favorite and is in demand almost everywhere.

USES

The red raspberry is essentially a dessert fruit and one which should reach the consumer promptly. It is also used by canners, and this may afford a good outlet to growers rightly located. It can be readily evaporated, but this is seldom done. The shrinkage is so great that the price at which the dried product must sell in order to yield a fair return for the fresh fruit seems high to the purchaser. A heaping quart basketful of fruit will weigh

about four ounces when dried, varying somewhat with seasons, variety, and the like. Seven or eight pounds of dried product to the bushel of fresh fruit is, therefore, all that can be expected. Furthermore, the true red varieties are dull and unattractive in color, when dried, which is unfavorable to their sale. The quality is excellent, but appearance counts for more in the sale of goods.

Varieties of the purple-cane class, like Shaffer and Columbian, are much better for evaporating than the true reds. The yield is heavier and the quality and flavor are excellent. They also possess a much more attractive appearance when dried than does the Cuthbert. It would seem that under some conditions, evaporating fruit of this class might prove profitable, although it is not being done to any great extent. As an outlet for surplus fruit in times of glutted markets, should such occur, the practice of evaporating commends itself if facilities are at hand for doing it. To plant even the purple-cane varie for evaporating alone would probably be unwise.

DURATION OF PLANTATIONS

Red raspberries may be kept in fruit for a number of years from the same plantation if it seems wise to do so. Wilson says [1] that eight to ten crops of berries may be expected from a patch, provided the plants are given good care and are kept free from disease. In a study of results obtained on different farms in New York state he found that a few plantings ten years old were yielding as heavily as the average of those from three to five years old. One

[1] The Cornell Reading-Courses, Vol. II, No. 36.

plantation of Cuthbert near Seneca Lake in New York state is said to be at least thirty-six years old, and is still bearing large nice fruit. The practical question is not how long can they be made to last, but how long will it pay to keep them. Many causes tend to weaken the plants and reduce their productiveness as they grow older. If they are healthy and vigorous, as they should be, the constant increase of suckers soon fills the row so full that they begin to suffer from crowding, unless severely thinned. This can be done, and should be, but is often neglected. Pulling these suckers is considered better than cutting them. This is readily done by using heavy leather mittens, but is not easy work. As the rows increase in width, grass and weeds gain entrance and are not easily dislodged. All this means greater expense as the plants grow older. Diseases and insects may also become more troublesome, not only reducing the yield of the plantation itself but serving as breeding grounds from which they may spread to other fields.

Considering all these factors, it is often better to replant after securing three or four good crops, rather than to try to keep the plants longer. The new plot can be started with less expense than will be needed to maintain the old one.

Although the plants are persistent, it is not difficult to rid a field of them when it is desired to do away with a plantation. Cutting the plants close to the ground, followed by deep plowing and thorough surface tillage will soon eradicate them. Continuing with any regular rotation will be all that is needed.

HARDINESS

In the eastern states, and probably throughout the greater part of the country, red raspberries are less hardy than black-caps. According to Kirkpatrick [1] the reverse is true in Minnesota. Some varieties are seldom injured in favorable locations in middle latitudes of the United States. The most common condition is that the tips are killed back somewhat but ordinarily not farther than it would be desirable to cut them at pruning time anyway.

It seems probable that lack of hardiness as frequently comes from want of ability in the leaves to endure the hot suns of summer as from lack of ability in the canes to endure the cold of winter. If by any means the function of the foliage during the growing season becomes impaired, the vitality of the plant is lessened, and it goes into winter poorly prepared to meet the conditions laid upon it during that period. Hence it seems but reasonable that lack of hardiness, or winter-killing, may result from insect or fungous injury inflicted during summer, as well as from unfavorable climatic conditions. It is an interesting fact that small, late-growing canes generally stand the winter better than the more vigorous ones of the whole season's growth. Cuthbert canes produced at the Cornell gardens, after cutting away all young canes early in July, came through the winter in better condition than the earlier, undisturbed canes in the other part of the same row These later canes were alive to the tip in spring. At the time the leaves were opening they were more uniformly green and farther advanced than the others. They pro-

[1] Minn. Farmers' Library Extension, Bulletin No. 16.

duced fine fruit, but since they are smaller than canes of the full season's growth, the yield might be less. One Iowa grower reports that in two seasons' trial, blackberry canes produced after pulling up all young shoots about the last of June, were loaded with fine berries, while older canes alongside had but few. Although such canes are later it does not necessarily follow that they are immature. Starting later, when the conditions do not favor so vigorous a growth, the wood may be firmer and its vitality greater at the beginning of winter than that of the earlier canes.

YIELDS

The average yield of red raspberries is less than that of black-caps, though under exceptional conditions and in some localities the reverse may be true. Estimates from a number of growers, obtained by the writer a number of years ago, gave an average of about 2,200 quarts to the acre. Average yields in western New York, as obtained by Wilson, were 1,784 quarts in 1909 and 1,351 quarts in 1910. The yields in 1909 were based on returns from 52 acres; those in 1910 on those from 155 acres. The average price received a quart was a trifle over nine cents in 1909 and something over ten cents in 1910.[1] Herrick and Bennett [2] place the average yield for Colorado at about 4,500 quarts an acre, under irrigation, considerably higher than that for black-caps. The yields are not only smaller, as a rule, but the ripening period is much longer. This makes the picking and marketing more expensive,

[1] Cornell Reading-Courses, Vol. II, No. 36.

[2] Colorado Expt. Station, Bulletin No. 171.

since there are never very many berries ripe at one time. The grower must, therefore, receive a considerably higher price per quart than for black-caps, or blackberries, if they are to prove equally profitable. As with all crops the yields are largely dependent upon the care and attention received.

NORMAL PROFITS

Forecasting profits in any undertaking is uncertain. So many factors enter into the problem that one can never safely predict the outcome. Red raspberries are nearly always in good demand. The grower who has a home market at hand is reasonably safe in expecting a price which will yield a fair profit on a well-grown crop. Large markets are much less likely to be glutted with reds than with blacks, but their smaller yields and poorer shipping qualities make them less desirable for distant markets. The cost of production, including rent of land, fertilizer, tillage, and the like should not exceed fifty dollars an acre. The cost of picking and packages will range from two to four cents a quart. At a selling price of ten cents a quart to the grower, there should be a fair margin of profit in the undertaking. Wilson found in his investigations, cited above, that the average gross returns to the acre were $162.91 in 1909 and $139.75 in 1910.

NOTE ON THE HYBRID REDS

Two classes of plants are really embraced in this hybrid group. One of these propagates naturally almost wholly

by tips, like the black-caps. This is the true *Rubus neglectus*, or Purple Cane type. It is to this class that the old Purple Cane, Shaffer, Columbian and others belong. These demand the same methods of planting, pruning and care as those given to the black-caps. The other class propagates chiefly by suckers, but can be made to root from the tips with proper care. These are essentially red raspberries in character, and demand the same care and treatment as red raspberries. Some of them approach so closely to the true red raspberries that they might even be more properly classed as such than with *Rubus neglectus*. To this class belong Philadelphia, Reliance and a few others. Caroline is a pinkish yellow berry, belonging to this category and thought to be a seedling of Brincklé's Orange, fertilized by some cap variety.

Many of these are excellent for the home-garden, owing to their great productiveness and rich flavor. The chief objection to them as a market fruit is their dull, unattractive color and their poor carrying quality. Some persons who cultivate them for market overcome this difficulty, in part, by picking them before they are fully ripe and while they are yet red. At this time they carry better and look better in market. In a home market, there is little difficulty in selling the Shaffer or Columbian, when fully ripe, dark as they are, when persons come to know them. They are among the best raspberries grown, for canning purposes, combining something of the flavor of both the reds and the blacks. Their color, when cooked, is no longer objectionable.

CHAPTER III

BLACK RASPBERRIES

THE black-cap raspberry is strictly an American fruit. Its culture is comparatively recent, and all the varieties grown belong to the same species, *Rubus occidentalis*, the common wild berry of the fields and woodlands. While not such a general favorite as the red raspberry, its hardiness, productiveness, ease of culture and its adaptability to the evaporating industry have given it a prominent place among our commercial bush-fruits.

SOIL FOR BLACK-CAPS

Black-caps succeed on a wide range of soils, but thrive best on one which is rich, deep, moist and well drained. Sandy or clay loams are preferable. A location where water stands for any length of time is never permissible. Let the grower who has ever gathered wild black raspberries recall how luxuriantly they grow in newly-cleared land, abounding in leaf-mold, and take a lesson therefrom. Virgin soil filled with leaf-mold is no longer available, but it is possible to greatly add to the humus in the soil which is to be used, thereby approximating the conditions found in the forest clearing. It should be remembered that humus greatly increases the drought-resisting quality of soils, a point of the utmost importance in berry-

Plate II. Black raspberries. Plum Farmer.

growing. A soil rich in humus will do much toward supplying the elements of plant-food needed, by rendering available that which is already in the soil and preventing its loss. In Kansas, the uplands having a black loam with clay subsoil, are reported to give the best results. Stony soils may yield good crops, but are even more expensive to work than with crops for which the ground is plowed every year.

Wilson found [1] that in western New York, loam soils gave better results than clay, as indicated by the following table:

Soils	*Acreage*	*Yield to the acre (quarts)*	*Income to the acre*
Sandy loam	77.85	1,434.50	$106.59
Gravelly loam	51.08	1,405.40	107.05
Clay soils	10.25	1,266.05	100.83

LOCATION

More vigorous growth and larger fruit can be obtained from the strong, moist soils of bottom-lands and valleys. Such fruit may not quite equal in flavor that grown on uplands but is more salable. There is always greater danger from frosts and from winter injury in very severe weather on low ground, except in the vicinity of large bodies of water. A cool, northern exposure, less affected by hot summer suns and less subject to drought, is to be preferred, though by no means necessary. A closely bordered basin is objectionable. Extremes of temperature

[1] Cornell Reading-Courses, Vol. II, No. 36.

are greater in such a location. In the bright days of summer with the sun pouring its intense rays into such a basin, the atmosphere becomes abnormally hot. At night the cold air settles into the same basin, with no opportunity to drain away, greatly increasing the danger from frosts in spring, and subjecting the plants to lower winter temperatures than those which prevail on the higher lands about. Steep hillsides are objectionable. Tillage is much more difficult on such lands and the loss of fertility and danger to the plants from washing during heavy rains are factors of importance.

Location with reference to market is not of so much importance with black-caps as with red varieties. The fruit is firmer and carries better, hence can be more readily shipped or carried longer distances without injury. When grown for evaporating purposes this factor is practically eliminated. The man far inland, with no railway or other public transportation facilities at hand, can compete on equal terms with the one who has a large market right at hand, except that the latter may supply the fresh market so far as conditions warrant, and evaporate only the surplus.

FERTILIZERS

Stable-manure is the most popular fertilizer among growers. It is especially suitable for black-caps, for they seem to demand heavier feeding than red raspberries or blackberries. Strong-growing plants are usually the most productive and bear the finest fruit. Even an over-supply of nitrogen is not so likely to produce a tender plant which suffers from winter-killing. In replies to questions sent to

growers some years ago, asking what fertilizer had been found most satisfactory, stable-manure was mentioned oftener than any other material; wood-ashes was also much in favor. The use of chemicals was less common then than now and stable-manure would be the material most likely to be used. It may not be the most economical, nor even the best material to use under all conditions, but it does give good results when properly applied.

One wide-awake grower replied that a Planet Jr. cultivator proved the best fertilizer with him. This is simply a modified version of the old adage that "tillage is manure," the full truth of which most of us have not yet come to appreciate. Such plants as raspberries do not make heavy drafts upon the soil. If therefore the physical conditions of the soil can be kept right and the chemical activities can be augmented, enough plant-food can be unlocked from most soils to supply their needs. Tillage does both of these and also assists to conserve moisture, without which no plant-food can be available, since it can only be used by the plant when in solution.

The quality of ordinary stable-manure is very uncertain, owing to differences in methods of feeding, and in the treatment which the manure receives after it is made. It commonly contains an excess of nitrogen. This, though by far the most expensive element of plant fertility, and one easily lost by leaching and evaporation, is required in only limited quantities in the production of fruit. The chances are, therefore, that in the use of large quantities of stable-manure this expensive element is wasted. An excess of organic nitrogen may also help to deplete the soil of potash. When changed to nitric acid it combines

with potash and other bases which leach away if not taken up by plants, thus depleting the soil of basic ingredients. The use of less manure, supplemented with chemicals containing phosphoric acid and potash, is often wiser.

According to the analysis of raspberries published from Washington [1] a crop of one hundred bushels of raspberries would remove only about six pounds of nitrogen, twenty pounds of phosphoric acid and fourteen pounds of potash from the soil. This being true, the importance of fertilizers may be easily overestimated. Fifty pounds of nitrate of soda or slightly more of dried blood, one hundred and fifty pounds of acid phosphate and fifty pounds of muriate of potash would more than supply this need. The unavoidable losses in the soil make it necessary to furnish more than the plants take away; yet this may serve as a suggestion regarding the possible demands. The individual qualities of the soil may modify the validity of calculations of this sort, since soils differ so much.

One factor in soil-fertility is not supplied by chemicals. That factor is humus, a more important one than the others. In this stable-manure has the advantage, but the same results may be obtained by the judicious use of green-crops before planting and of cover-crops afterward.

PROPAGATION

In practice, there is but one way of propagating black-caps. That is from the tips formed where the ends of the canes take root. Plants can be grown from root-cuttings, or by burying the entire cane and cutting it

[1] Year Book, Dept. of Agr., 1895, 568.

in pieces after roots have been thrown out, but these methods are seldom used. In sod ground, the tips take root readily, unaided, for they work their way in among the grass roots and are thus held in place until roots are formed. In cultivated ground they are usually blown about by the wind so much that they cannot get started. For this reason it is necessary to put the tips down and cover them with soil in order to secure many plants. This may be done with a hoe, a spade, or any other convenient implement. Better plants will be produced if the tip is pointed well downward, so that the end is the deepest part when covered.

A tool hung somewhat like an adze, but with a narrower blade is found useful by some persons. Such a device was first suggested by L. J. Farmer of Pulaski, New York, and is used largely in planting strawberries. It is made about as heavy as a good-sized hammer, so that it can be readily swung in one hand.

An implement on the plan of a spade, but with a narrow blade like a pruning or weed-spud would work well except on very stony ground. The blade should be strong but need not be more than six or eight inches long. A cross-bar on which to put the foot, for thrusting it into the soil, should be provided. With such an implement, the tips can be quickly fastened. It should be moved back and forth slightly after entering the soil, the tip inserted, then the tool thrust in again at the side and pressed toward the former opening to firm the soil about the tip and hold it in place. Either of these implements can be made by a blacksmith.

Plants should be propagated from young plantations if

feasible to do so. The tips from young bushes root more readily and produce more healthy and vigorous plants. A plant which has borne several crops of fruit, under ordinary methods of care, becomes weakened in vitality, and this lack of vigor naturally extends to the young plant produced therefrom. Propagation from old plantations is especially objectionable if the plants are affected with anthracnose, or other fungous disease, as many old plantations are. The tips should not be covered until they begin to thicken and assume a leafless "snake-like" appearance. This condition usually begins about the middle of August, in middle latitudes.

PLANTING

Spring planting is to be preferred for black-caps, and if possible, it should be done early. The new shoot which springs up from the tip is very tender at first, and easily broken. It is, therefore, much better to remove and set the plant before growth begins. Failing in that it is well to allow these shoots to become strong enough to bear handling without being broken. If for any reason it seems best to get plants in the fall, a good method is to plant them close together in shallow furrows and mulch them well for the winter. They are left in this position until the young shoots have made a growth of several inches in spring. They are then set in their permanent place. By this means any poor plants may be weeded out and a perfect stand secured in the field.

The plants should be set deep under ordinary soil conditions. Three to four inches is none too deep for best

results. This does not mean that they should be put in the bottom of a hard furrow at that depth. The land should be well pulverized as deeply as it can conveniently be done, so that the bottom of the furrow will be mellow and friable like the rest. The plants are set in the bottom of the furrow but covered only enough to insure a proper start at first. The earth should be well firmed about the roots but preferably with a little loose mellow soil on top. The furrow is then gradually filled in later with the ordinary tillage given, as growth progresses. At the outset, plants so set may not make so vigorous and even a start as if set nearer the surface, but they are likely to withstand drought better and the canes are not so easily blown over. On many soils, especially those not well drained, there is trouble from heaving during the winter. As time goes on the crown of the plant may be lifted entirely above the ground level, leaving only roots beneath. Deep planting helps to obviate this trouble to some extent. On land where the subsoil is high and hard deep planting will not prove satisfactory. It means that the roots find the soil conditions too unfavorable in such situations.

The young plants should be closely cut back when set. Inexperienced growers may sometimes neglect this. Even long canes are sometimes left, in the hope of getting fruit at once. This is a mistake, for any fruit obtained the first year is at the expense of the growth and vitality of the plant. It will be deducted from succeeding crops several times over. Plants which are not well cut back do not throw up young shoots from the root so readily, being more inclined to branch out from the old cane. Four to six inches of the old cane is enough to leave with

the tip, just enough to furnish leaf surface to keep the plant growing until the young shoot gets under way.

If the old canes are affected with anthracnose it is better to cut them away entirely before taking the plants to the field. This leaves the young tip dependent upon its own shoot for leaf surface but this is better than allowing it to battle with disease from the start. It is wiser to keep the plantation free from disease, in so far as possible, than to introduce it and then attempt to fight it afterward. If the pieces of cane left with the tips carry anthracnose spots when planted, the disease is transferred to the new plantation with as much certainty as the plants themselves. Diseased canes should be destroyed, or at least not allowed to lie about the field where the planting is going on. These fungi are as truly plants as the ones on which they live, and their seeds (spores) are as sure to germinate and grow if given proper conditions.

If black-cap raspberries are to be planted in rows, three feet in the row, with rows six feet apart, will be found satisfactory distances. Some prefer rows seven feet apart; for very strong-growing varieties this may be better. If in hills, they should be not less than five feet apart each way, which may do for weak and slender-growing varieties, but as a rule six feet is much better. Black-caps are more easily kept in good condition in rows than red raspberries and blackberries, but the intermediate space between the plants must be kept clean by hand. It is therefore more expensive to care for an acre thus planted than when in hills far enough apart to admit of horse cultivation both ways. Larger and finer fruit can also be obtained from hills farther apart, with thorough cultivation on all sides.

The main question is the yield. Those who have tried it most thoroughly are most confident that the yield is fully as good in hills as in rows.

TILLAGE

A few special points regarding tillage are worthy of attention. The first of importance is that it should begin early in spring. Most soils are fairly loose and mellow when the frost first leaves, but many become very hard after a few spring rains have beaten them down and the sun has dried them out. With favorable weather, so that cultivation can be started promptly after the frost leaves, the surface of nearly all soils can be readily put in good condition with any ordinary cultivator. If left until it becomes dry and hard, almost any cultivator will fail to do this, except on light and porous soils. A plow is sometimes used for the first working, but this is not desirable. Even with a light plow, and turning as shallow a furrow as possible, the surface is left in an unfavorable condition. If the furrows are turned from the rows the roots may be disturbed and many of them are left too near the surface. If turned toward the rows a ridge is formed underneath the plants, which soon becomes objectionable if the process is repeated, unless some means are used to work it down again.

When cover-crops are used, it is especially important to start the work early in spring, if it is to be done with the cultivator alone, unless the crop is one which is killed down by the winter. Tillage should be frequent throughout the early part of the season, in order to maintain a good

dust mulch and conserve moisture for fruit development. Fine fruit is a compound of carefully filtered water, with delicate fruit flavors. The more water the product contains the finer the product and the better it pleases the customer. Careful attention to the moisture supply is therefore one of the prime essentials in successful fruit-culture.

Opinions differ as to how late tillage should continue, but if tips are to be put down for propagation tillage will need to stop when that is done. On average soils there is little danger of forcing too much late growth by continuous tillage.

PRUNING

The first pruning in the life of a black-cap plant is to cut off all but a few inches of the old cane from the tip when it is set, as explained under the head of propagation. The next step, in ordinary commercial practice, is to pinch back the young shoot when it reaches a height of not more than eighteen to twenty-four inches. The younger or weaker the plant, the lower should be the point at which it is stopped. The object of this pinching, or clipping, is to stop the growth of the main shoot and cause the formation of strong, lateral branches near enough to the ground to form a sturdy, self-supporting bush. This shoot will increase in height considerably after it is clipped, if done at the proper time. It is therefore important that it be nipped low. It is also important that it be done when the shoot reaches the desired height. If neglected until it has grown taller and then cut back to the desired height, the buds which are left will be slower in starting

into growth than those near the tip. If tipped at too high a point the result will be a tall, top-heavy plant easily blown over or broken down.

If done at the right time these shoots can be pinched off with the thumb and finger as easily as in any other way. In practice it is not easy to reach them all at the right time so that some implement may be useful. Sheep-shears are very convenient for this purpose. In young plantations, where there are no old canes in the way, a sharp knife or sickle will do the work more quickly.

Tipping, as above described, is the only pruning demanded the first season after the plant is set. The next step is to shorten back the lateral branches the following spring. These are ordinarily left from twelve to eighteen inches long, but this operation should not be done by rule. As previously suggested, this is the thinning process in handling bush-fruits, and should be done with judgment. The length of the lateral should be influenced by the age and vigor of the plant, the fertility of the soil and its moisture-holding capacity, the care and fertilizer given, etc. There is sometimes a temptation to leave too much wood, especially the first year of fruiting. It is possible, by leaving the canes long, to secure a fairly large crop the first year, but when this is done the plant's energy is so absorbed in fruit production that little is left for wood growth. The succeeding crops are therefore much less satisfactory than they otherwise would be.

The above method is the one commonly in use in growing black-caps, but an occasional grower prefers to omit the summer pinching of the growing shoots, allowing them

to form one long, tall, unbranched cane. This is merely shortened back in spring as conditions seem to warrant. When this method is followed the canes are often tied to stakes or trellises. The plan reduces the work of pruning, but that is more than offset by the trouble of staking or trellising if that is done. One point worth considering in connection with this method is the fact that diseases are less likely to be troublesome, especially anthracnose. In small, confined areas, especially on low, moist ground, this may be a matter of considerable importance. Perhaps it is largely for this reason that plantations are thought by some to last longer if handled in this way. The yields do not appear to average as well as by the former method.

The last step in pruning is to cut away the fruiting canes after they have borne. The best time to do this is as soon as fruiting is over. At that time they are still alive and green and cut much easier than if left until winter or the following spring. Removing them also gives better opportunity for free circulation of air through the plantation. This tends to check the spread of fungous diseases. Some insects which work in the cane also spend the winter there, and may be destroyed by promptly removing and burning them. Removing the canes as soon as fruiting is over gives a good opportunity for thoroughly tilling and cleaning up the plantation before beginning to put down the tips for the growth of new plants. If too many young canes spring up in the hill, part of them should be removed when the old canes are cut away, unless it has been done before. Not over five should be left; three may be even better.

When a plantation is to be discontinued, it is sometimes advisable to go through and pull out all young shoots the last summer so that the energy of the plant may be directed to fruit-bearing. This is said to hasten ripening slightly and carry the fruit through in somewhat better condition, especially in dry seasons.

HARVESTING

Gathering the fruit is the most troublesome part of berry-growing. The availability of pickers is the first point to be considered in starting the business. Details as to methods of picking need not be repeated here as the same methods apply as with red raspberries and other small fruits.

When grown for evaporating purposes it can be done by "batting" the fruit into a berry harvester. This method makes it possible for any farmer to take up this industry, no matter how remote he may be from towns or railways. In fact it makes the growing of raspberries for evaporating one of the best lines of fruit-growing for such locations, since it is a line in which the cost of delivery is almost entirely eliminated. The man with a ton of dried raspberries to market can afford to take them ten or fifteen miles to ship if need be. He will still have a very small percentage charge against the value of the produce. With a ton of potatoes or hay the percentage is far different. It is in locations where pickers cannot be readily obtained that the chief value of this method of harvesting lies. The final cost of preparing the fruit for market is not materially different whether picked by hand

or gathered with the harvester but it is differently distributed. Under some conditions one method will prove best and under other conditions the other will be most satisfactory.

The harvester shown in Fig. 11 is a simple affair, consisting of a canvas tray some three feet square, there being only enough wood about it to form a frame-work and enable it to be moved about. Under the corner which rests on the ground, there is a sort of shoe of wood, enabling it to be slid along from bush to bush. In one hand the operator carries a large wire hook, with which the bushes are drawn over the canvas, or lifted up if too low down and in the way. In the other hand is a bat, resembling a lawn-tennis racket, with which he knocks off the ripe berries. This bat is merely a canvas-covered loop of heavy wire fastened in a convenient handle. In place of this, some use a wooden paddle, at the risk of bruising the fruit unnecessarily. In gathering by this method, the berries are allowed to become very ripe, and the plantation is gone over but two or three times in a season. Many dry leaves, some stems, and a few green berries, are knocked off with the fruit. The leaves are not objectionable, for they help to absorb moisture before and after drying, and may aid in preventing mold if the fruit has to stand for some time before going to the evaporator. The leaves are quickly taken out by running the fruit through a fanning mill after it is dried. Some

Fig. 11. Berry harvester.

growers fan them out before drying, but this has the disadvantage of bruising and crushing more berries. The berries are usually allowed to stand in the field in boxes for a time after gathering, and any insects which may have fallen in are likely to crawl out and disappear.

Growers who have had much experience say that a man will average eight to ten bushels a day with the harvester, although much more can be gathered in the best picking. On one farm visited, two men and two girls had gathered thirty-one bushels the day previous in ordinary picking, and one of the men had been in the field but part of the time. This shows the first cost of gathering to be less than half a cent per quart. Running them through the fanning mill costs but a trifle. Before marketing they are picked over by hand to remove stems, green berries and other litter. This costs about one cent a pound, and is sometimes paid for by the pound at that rate. The whole cost may not exceed one cent a quart, as against two cents usually paid for hand-picking. There are those, however, who think that in the end there is not much difference in the expense, whether gathered with the harvester or picked by hand. Growers who have had experience with both methods express the opinion that harvesting yields a better quality of dried fruit than hand-picking, for the reason that, if picked by hand, they cannot afford to look them over again after drying, and so they do not go to market in as clean and nice condition as those which come from the harvester.

Some extensive and general fruit-growers find it inconvenient to look over the dried product at the same time that other fruits, which follow on after the raspberries,

are claiming their attention. For that reason they prefer to pick a large part of the crop by hand and market it fresh, if pickers are to be had. In that case, they find the harvester a great convenience to finish up the last of the crop. Every grower knows how much dissatisfaction occurs in keeping the pickers at their work after the berries begin to grow scarce. With the harvester, the late berries can all be gathered at one time with much satisfaction to all concerned. This plan is also available for those who sell their fruit fresh. The last of the crop can be gathered and dried, thus affording relief to the market and to the patience of the grower and pickers.

This method of harvesting was invented and introduced by Jewett Benedict, of Dundee, New York, and is extensively used by the berry-growers of that region. Most of the harvesters in use are simple home-made affairs, and various modifications have been adopted to suit the tastes of individual growers. Several of these are described in Farmers' Bulletin No. 213 from the Department of Agriculture at Washington. There is some loss of fruit in harvesting but the amount is not large.

METHODS OF DRYING

Drying out of Doors

Various methods of drying are employed, the simplest of which is to dry on boards in the sun as illustrated in Plate III. This usually takes from three to five days. Platforms or trays about twelve feet long and three to four feet wide are made of matched boards. A narrow strip is nailed around the edge of each tray to prevent the berries from

rolling off. The trays rest upon long horses made of scantling, to hold them at a convenient height from the ground. A little block is tacked across each corner of the trays, so that at night or in case of a shower they can be stacked up on top of each other and covered with boards or canvas. This is of necessity a slow way of drying, and the cost of lumber for trays to handle a large crop would be an important item. One of the chief objections to the method is the large number of flies which it calls to the scene, the attentions of which do not render the fruit more appetizing. Indeed, those who are familiar with the method are often prejudiced against all dried raspberries. Sun-dried raspberries are usually quoted about one cent a pound below evaporated berries, but consumers can never be sure which they are getting. These trays might be covered with fly netting, but this would increase the time needed for drying, and would not wholly obviate the difficulty, unless the netting were held above the fruit. If laid directly upon it little would be gained. A single attempt to dry blackberries under glass when covered with netting proved such a failure, inducing so much more molding than without the netting, that the plan would probably prove unsatisfactory.

Drying under Glass

Another method employed by those who have greenhouses for the winter forcing of vegetables, is to utilize the space under glass during the berry season for this purpose. In this situation the berries usually dry in about three days, in bright, warm weather. The glass affords protection from storm but not from flies. It is advisable to

have as much air passing through the house as possible, hence the door and ventilators are left open. By using screen doors and protecting the ventilators with netting, most of the flies might be excluded.

Drying with Evaporators

For a business of any considerable extent, drying with an evaporator is by far the best method. The results are more rapid and certain and the product better. More pounds of fruit can be obtained from a given quantity of green fruit, too, than when dried in the sun. The higher heat of the evaporator more quickly dries the surface, while retaining the juices within, so that the fruit can go to the curing-room while much greener than it otherwise could. Sun-dried fruit becomes dry and hard, much as it is sometimes found on wild raspberry bushes late in the season. When properly cured the evaporated product remains more soft and spongy. It then soaks out more quickly and assumes more of its natural condition.

Many types and makes of evaporators are in use. Most of them depend upon hot-air furnaces of various kinds to do the work. In some large establishments the heat is supplied through coils of steam pipes. This method is especially adapted to situations where a power plant is in use for other purposes, so that the exhaust steam can be used for heating the evaporator. One advantage of steam lies in the fact that there is no danger of scorching the fruit. This is not a matter of great importance, for with reasonable care there is little need of this in any good hot-air machine.

Plate III. Evaporating. Drying on trays in the sun; an evaporating establishment, using heat.

The temperature of the stack should run from 160° to 180° Fahrenheit. One important essential is a strong draft of fresh air through the machine. A large amount of vapor is given off by a machine full of hot, green fruit, and it needs to be removed and replaced with dry air as rapidly as possible. Much more fruit can be dried in a bright, fair day, with a brisk northwest wind, than in a damp, cloudy and still day. In some of the large horizontal machines the necessary draft of air is secured from large fans revolved by steam power.

The commonest type is some form of stack in which the trays are put in at the bottom, directly over the heat, and gradually lifted to the top as others are put in beneath. When dry they are taken out on the floor above, the trays being returned to the lower floor for refilling. One serious objection to this method is the fact that the work must be timed and a tray put in just often enough so that a dry one can be removed from the top. This is not easy, even with experience, for as above noted, weather conditions greatly modify results. A type described by Corbett [1] reverses this operation, putting in the green fruit at the top and removing the dried product at the bottom. The advantage claimed for the method is that the vapor from the green fruit will be more quickly removed without passing over that which is more nearly dry, and that quicker results, less dependent on atmospheric conditions, are to be obtained. A modern type evaporator is shown in Plate III.

In the Williams evaporator, one of the earlier makes, the trays were placed on hangers attached to endless

[1] Farmers' Bulletin, No. 213, U. S. Dept. of Agr.

chains revolving over two shafts. When first put in, the tray was dropped down directly over the heat, moving from there up one flue of the stack, over the top and down to the place of entrance. Each hanger had space for seven trays, but only one was put in at a time, so that each tray passed up and down the stack several times before it was removed. This gave full opportunity for the "stackman" to examine the fruit and note the progress of drying. Any tray could be removed, independently of others, whenever it came opposite the entrance door, or could be brought there at any time. While very convenient, this type of machine did not so fully utilize the space within the stack, and seems to have dropped out of use.

The fruit is taken from the evaporator when only partially dry, a small percentage of it being still soft. It is then placed on a curing floor, where it is shoveled over daily for some three weeks. Instead of the curing floor some now use small curing boxes, the fruit being turned from one box to another each day. This plan may economize room and perhaps secures greater uniformity of moisture content when ready for packing. By this process of slow curing a much softer and better product is secured than could be done by drying them hard in the machine. The weight of marketable fruit is also greater. Being soft and spongy it can be more easily packed. When used, such fruit will readily take up water and regain much of its former character.

A good historical account of the evaporated raspberry industry, as given by Bailey, will be found in Bulletin 100 of the Cornell University Experiment Station. No marked

changes in the industry have appeared since that was written, except that its location has shifted somewhat. Few are now evaporated in Wayne County, Dundee being the center of the industry at present. It has spread fairly well over the eastern part of Yates and northeastern part of Schuyler counties.

A Western Method of Drying

A novel method of drying raspberries is reported from Idaho.[1] The climate is there so dry that the berries are dried on the bushes. The fruiting canes are laid down in spring to keep the young shoots from mingling with them. Two men with a pole do this and they are held down by a wire. The canes are cut with a horse and sled cutter, rolled into bunches and stood up against the new growth to dry, which takes from four to seven days. A wagon with flat-bottomed rack and high sides is then driven through. One man pitches the bundles on and two others thrash off the berries with forks into the rack. It is said that three men can thrash and fan some three acres per day. Each berry carries a stem, which is removed by running them through a machine with rollers designed for the purpose. Idaho conditions are considered ideal for the purpose and when the irrigation and culture have been right the fruit is claimed to be much sweeter and richer than that which is hand-picked and evaporated in the East. Two men are able to care for forty acres, with one or two extra for a month or so during harvest. The writer claims that the method practically eliminates the

[1] Rural New Yorker, 1909: 963 & 1041.

cost of harvesting, since by this way it is little more than that of removing the old canes in ordinary culture. He claims a yield of 1,000 pounds an acre at a cost of production of $20 an acre. The method is interesting as showing the possibilities of adaptation to differing conditions.

MARKETING

When sold fresh, black raspberries are usually marketed in the ordinary quart baskets. They hold up fairly well in these, and being one of the cheaper berries, this package meets the demands of most markets well. The berries would be more attractive and handle better in pints, if the market would warrant it. This might be found advisable for the first of the season in cases where a satisfactory price can still be maintained.

The dried fruit is marketed either in barrels or boxes. The boxes used are the same as those in which evaporated apples are packed, being about 12 by 12 by 24 inches in size, and holding 50 pounds of fruit. In packing dried fruit an extra heavy box, without bottom, is placed on top of the one to be filled and some form of press used to force the required weight into the packing-box. The product is usually marketed through commission men or large wholesale houses.

DURATION OF PLANTATIONS

The life of a plantation will depend somewhat on how it is handled. Plants may live and bear fruit for many years. They may last longer when allowed to go un-

pruned and uncared for than when given good care. The point to determine is not how long they will live, but how long will they pay. With ordinary good culture it is seldom wise to harvest more than four crops. Of these, the first crop is only a partial one. As a plantation grows older, more labor is needed to keep it in condition. The yields grow less and the fruit smaller. More profit is therefore likely to result from tearing it out and replanting, after a few good crops, rather than in trying to keep it bearing longer.

CLEARING THE GROUND

To rid a piece of ground of black raspberry plants, when no longer wanted, is comparatively simple. Mow, rake together, and burn the bushes, after fruiting. Then plow deep and thoroughly, turning out all the berry stumps, and the work is practically done. Some of the plants will throw up shoots again when not thoroughly uprooted, but they can be subdued with little trouble. This first plowing is heavy and slow work, and many of the stumps will drag out and interfere in a measure with the subsequent harrowing, but aside from that, there is little difficulty. If the land is to be used for small or fine crops, these stumps will need to be removed, but for potatoes or corn they will cause little trouble. Raspberries seem to leave the land in fine condition for other crops. One may expect a good piece of corn to follow a raspberry plantation when turned under.

HARDINESS

Black raspberries are among the hardiest members of the bramble family. Even the more tender varieties will withstand the winters of most localities in middle latitudes without injury. In severe climates, and especially in the Plains region, winter protection becomes necessary. Even when not entirely killed, plants are often so weakened in vitality that the yield is unsatisfactory. Under such conditions, laying them down for winter is to be advised. Much depends on the condition of the plant during its season of growth. Plants probably "winter-kill" in August as well as in January. Good tillage, and protection from insect and fungous injury during summer may be as important as protection from cold in winter.

YIELDS

Some years ago a number of New York state growers were asked to give their estimate of a fair average yield of black-caps to the acre. The replies varied widely and came from commercial growers and from those who only grew a small number in the home-garden. Averaging these estimates as best it could be done, gave about 2500 quarts as the amount to be expected from an acre. The figures were worthy of confidence, because they came from practical men who were in the business, but were only estimates, not actual records. More recently Wilson has found the actual yields in commercial plantations to be considerably less than this.[1] He gives records from 134

[1] The Cornell Reading-Courses, Vol. II, No. 36.

acres, including several varieties, the average yield being a little less than 1500 quarts to the acre. The average money return from these fields was about $112 for each acre.

The yield in pounds of dried product to a bushel of green fruit varies greatly with different seasons and parts of the same season. Early in a wet season, when the fruit has made a quick, vigorous and watery growth, it may take four quarts to make a pound of dried fruit. At the end of a very dry season, it may take only two quarts. Growers expect to average about ten pounds of dried fruit to the bushel. Varieties differ considerably in this respect. The Ohio is one of the heaviest yielders, in proportion to the amount of green fruit, owing largely to the greater number of seeds. It is one of the poorest in quality, and possesses less food value per bushel than other varieties. The Gregg follows it closely in yield and is a better berry. In some experiments with seedlings, Goff found that small and juicy berries yielded a higher percentage of evaporated fruit than larger and dryer ones, showing that it does not follow that a berry which is dry in texture will give a good yield when evaporated. In point of quality and food value, the Shaffer ranks among the best. From the consumer's standpoint varieties of this type are among the most desirable. They are so near like the red raspberries that when evaporated the quality is fully equal, if not superior, to that of the true reds, while the yield of dried fruit per bushel is not very far below that of the black-caps. It is certainly an excellent berry to dry for the home market, where the price can be made to conform to the cost of production.

The man who is growing berries to evaporate is not likely to suffer so seriously from drought as the one who sells his fruit fresh. Dry weather reduces the number of quarts per acre more than the number of pounds of dried fruit. A long drought, extending through the early part of the season, does injure the yield, but dry weather at ripening time only, need cause no serious loss if the cultivation has been frequent and thorough. The man who will till and care for his plants as he should is nearly independent of drought.

USUAL PROFITS

Based on Wilson's figures for average yields of fresh fruits to the acre, as previously quoted, and estimating the yield of dried fruit at ten pounds a bushel, the average amount of dried fruit to be expected from an acre will be about 500 pounds. Wholesale prices for the finished product vary, but in recent years have usually ranged from twenty to twenty-five cents a pound. Formerly the cost of harvesting and marketing ran about as follows:—Harvesting with the berry harvester ½ cent a quart; evaporating, 2½ cents a pound; cleaning for market and marketing each 1 cent a pound. Changed conditions may alter these figures somewhat at the present time, but they will serve as a basis on which the inexperienced man can form some estimate of the probable outcome of the undertaking under favorable conditions. On this basis the gross return to the acre should be $100 to $125, from fields in full bearing. The cost of harvesting and marketing would be $30 or more, leaving the remainder to pay

for the cost of growing, including rent of land, fertilizer, planting, care, oversight and other overhead charges, and profits. To the man with a taste for this kind of work whose soil, site and climate are favorable, the growing of black raspberries for evaporating purposes can be recommended with confidence. Especially is this true for the man who does not have a good local market and is so situated that he cannot easily secure pickers for other lines of small-fruit growing.

A price of twenty cents a pound for the dried product will be equivalent to about six cents a quart fresh. Accurate figures concerning cost of production are hard to secure, and each grower can make his own estimates best. A crop of potatoes can be grown between the rows the year of setting, which will usually repay that year's cultivation, exclusive of the cost of plants, while the second year's crop of fruit will do the same, and perhaps more. Plants can be bought at $6 to $8 a thousand. If set three by six feet, it requires 2,420 plants to the acre. If set farther apart than this, the number required is proportionately less.

The fear of over-production discourages some persons from undertaking work of this kind. The raspberry industry does not differ from other lines of farm enterprise in this regard. So long as human nature remains the same, fluctuations in product and prices may be expected to continue, whether the product be potatoes, cows, wheat or raspberries. While evaporated raspberries do not rank as a high grade product and are not in as great demand as many other articles of food, the total consumption is still large. The individual grower need have little fear of not finding a market for his output.

CHAPTER IV

BLACKBERRIES

The blackberry, as a cultivated plant, is an American fruit. The child of our eastern hills, woodlands and mountains, its introduction to the garden and field has been recent. Methods and varieties are, therefore, alike new. In many localities the abundance of the wild fruit still interferes with the profitable culture of the garden varieties. Much improvement is yet to be expected in varieties and perhaps in methods.

According to the census of 1910, there were growing in the United States in 1909 about 49,000 acres of blackberries and dewberries. Missouri leads in production, with nearly 6,000 acres, followed by New Jersey, with 4,332 and Michigan with 3,500, while Wyoming and Nevada each report one acre or less.

SOIL

Considerable diversity of opinion exists among growers regarding the soil best suited to the blackberry, a diversity which is no doubt due, in part at least, to the fact that a blackberry is hard to kill. It is likely to make a partial success wherever it may chance to be, for it possesses a genuine courage which knows no failure, and bravely sets out to make the best of existing conditions.

Many hold that only a comparatively light and poor

soil is suitable, in order that the plants may not make too great a growth of wood at the expense of fruit-production. On the other hand, growers in the prairie states, where the land is naturally rich, do not recommend their poorer soils. A strong, well-drained clay loam meets with the most general approval, though light, warm land, having a porous clay subsoil, may give excellent results. On these stronger soils, plants have frequently passed the winter unharmed when in parts of the same field on more sterile soil they were badly winter-killed.

A soil that is retentive of moisture is imperative, this being the prime essential in blackberry growing. For this reason a cool, northern exposure is generally preferable, because such a location will help to offset injury from drought, the arch enemy of the blackberry. Deep working of the soil before planting, and natural or artificial drainage, are essential both to conserve the necessary moisture and to prevent over-supply. None of our cultivated brambles can make satisfactory terms with a wet, heavy soil, and any attempt to compel them to do so will surely result in failure. Land with a high and hard subsoil, therefore, should be tile-drained before planting.

FERTILIZERS

Do blackberries need fertilizers? Some say no; others yes. There must be a reason for this difference of opinion. On strong, moist soil blackberries may produce such a rampant growth that they nearly forget to bear fruit. These overgrown, poorly matured canes are then likely to suffer from the cold of the succeeding winter, and to

be left in a condition to repeat the same behavior the following season. It is a significant fact, however, that western growers, who may be fairly presumed to have a stronger soil, are strongest in their recommendations of liberal fertilizing. The following statement from O. B. Galusha, as reported in the Transactions of the Illinois Horticultural Society for 1880, is worthy of careful consideration: "A generous feeding of the soil is amply repaid in liberal crops of fruit. In my older plantation, the soil was equally manured throughout, and yet on one side it is naturally considerably richer than the other, and this side produces fully one-third more fruit than the other." This same principle will apply equally well to ordinary soils throughout the country, as a whole. If properly managed and pruned, the plants will be able to transform a large amount of plant-food into luscious berries and laughing dollars. Heavy applications of stable-manure to young plants, which have not yet sufficient wood to carry full crops, may work injury, especially if on strong, moist soils. On soils of this character, nothing is needed until the plants are in full bearing. If additional plant-food is then desirable, commercial fertilizers, may better fill the need.

In the use of chemicals, a quick-acting carrier of nitrogen, like nitrate of soda, is to be preferred. This, if applied early in the season, at the time when growth is beginning, will do its work with time for proper ripening of the cane to insure best conditions for withstanding winter injury. For the same reason, stable-manure, when used, should be applied in fall or winter, rather than spring or early summer.

Since potash has been shown to increase the sugar content of fruits, its use for the blackberry is especially desirable. The greatest fault with the cultivated blackberry as a dessert fruit is its acidity. Whatever treatment will tend to reduce that acidity is worthy of trial.

The blackberry is not particularly sensitive to soil acidity. Lime is therefore seldom essential to best results.

PROPAGATION OF THE BLACKBERRY

The propagation of blackberries, by means of suckers, as commonly done, is a simple operation. The plants attend to the matter themselves, the cultivator need only care for the product. Keeping down suckers, in fact, is one of the most troublesome operations in blackberry growing. When produced in large numbers, their effect is to detract from the vigor and productiveness of the parent plant. A plantation will soon become choked with young plants if left undisturbed. Unless these plants are wanted for sale or for planting, vigorous measures are needed to hold them in check. If a market for them is at hand, they may prove more profitable than the fruit.

If many plants of a new and high-priced variety are desired, the number of suckers may be increased by cultivation which tends to disturb the roots. Thrusting a spade into the ground in circles several inches apart about the parent plant will sever many of the roots, practically making root-cuttings of them, thereby causing a large number of plants to spring up. Some careful observers assert that close pruning also tends to increase the number of suckers.

Plants in large numbers can be cheaply produced from an old plantation which is to be discarded, by cutting away the bushes, plowing and cultivating the ground in spring, then letting everything grow. If the land is poor, manuring will increase the vigor of the plants. Roots have also been found to throw up more suckers when in contact with coarse manure.

Propagation by suckers is the most common method, and answers equally well for practical purposes, yet root-cuttings are often used, and give excellent results. This is especially true where a speedy increase of choice varieties is desired. The blackberry is particularly well adapted to this method of propagation, and all the work can be done out of doors. The cuttings may be made either in fall or spring. All roots three-sixteenths of an inch or more in diameter may be used, being cut into pieces two or three inches long. If taken in the fall, they should be stored in boxes of moist sand, which should be kept in a cellar during the winter, or be buried outside on dry ground, where no water will collect about them. It is well to have holes or cracks in the bottom of the boxes, to allow the escape of surplus moisture. The cuttings should be stratified in the boxes in the same way that seeds and nuts are, with a layer of sand or soil, then a layer of cuttings, another of sand, and so on. With favorable winter conditions, callusing will have begun before spring, so that the pieces will be in good condition for planting. For this reason cuttings taken in the fall and properly treated during the winter, usually give better success and a more vigorous growth than those taken in spring. In spring the cuttings are planted out in loose, mellow soil,

in trenches two to three inches deep, depending upon the comparative heaviness or lightness of the soil, and about three inches apart in the furrow. They are covered and the soil firmed over them, the same as in planting peas, potatoes, or any other garden vegetable. Mulching the ground with a light layer of straw, sawdust, or similar material, to prevent it from drying out, aids their growth and helps to insure a good stand.

For those who have greenhouse facilities, a very satisfactory way is to take up the roots and make the cuttings as early in spring as the ground will permit, stratifying them in boxes of sand as already described, and placing them under the greenhouse benches. Later, as other plants go outside and space permits, these boxes are placed on the benches. By this treatment the cuttings become callused, and are in good condition to go into trenches outside by the last of May.

With an especially choice variety where it is desirable to increase the stock with the greatest possible speed, the cuttings may be made smaller, one-half to one inch long, and the whole operation be carried on under glass. Such cuttings are best placed just beneath the surface in beds of sand, and furnished with a gentle bottom heat. The plants are potted off as soon as buds have been developed and are well under way, or when leaf-growth has begun. Sometimes they are sown in shallow boxes of soil after the callus and buds have developed, and allowed to remain till several inches high, then potted, or even set from here directly into the open field, if the weather and soil are in suitable condition.

PLANTING

The question of when to plant should precede the question of how to plant. As noted in Chapter I, there are advantages both in spring and in fall planting. Few failures are likely to result in either case if proper precautions are taken. Plants set in late fall should be protected with a covering of soil or coarse manure during the winter. In the great Plains region of the Middle West, fall planting is less likely to succeed than in the moister climates of the East. Winter drought there prevails as well as summer drought, and plants often perish for lack of moisture during the winter months.

Neither is fall planting to be generally advised under conditions at the opposite extreme, where the rainfall is excessive and the winters open, but with much alternate freezing and thawing, as along the southern New England coast. In such localities excessive heaving may cause serious loss. Under average conditions, fall planting is to be preferred to late spring planting. If the work can be done at the right time, plant in spring; if not, plant in fall.

Thorough soil preparation is the first essential in the planting of all fruits. This has already been discussed, but can hardly be over-emphasized. Soil texture is one of the fundamental factors in soil fertility, and good tillage is one of the primary means by which it may be secured. Thorough, deep plowing and harrowing will not only make the work of planting easier and more effective, but will add much to the later growth and development of the plants. Any previous treatment which will increase the humus

content of the soil will also help to insure the future success of the undertaking.

Whether to plant in hedge-rows or check-rows, must be decided before planting begins. The decision will be in-influenced both by circumstances and by the individual preference of the grower. Many fields cannot well be cultivated in both directions. This may settle the matter at the outset. Much difference of opinion seems to exist as to which is the better method, where either one is feasible. The method of training to be used will also help to determine the plan best adapted to the individual case.

Those who advocate the check-row system claim that larger and finer fruit is produced, with less hand work. To keep a hedge-row free from weeds and grass is a laborious and troublesome undertaking. Working both ways with the horse and cultivator, taking care to keep the hills well within bounds, does away with much of that work, but increases the amount of horse-work. It is generally believed that the yield from hills is less than from hedge-rows, but some advocates of the hill system claim that this is not the case. It would seem that to secure satisfactory results from hills these hills would need to be left quite large, and in that case there would still be considerable opportunity for weeds to grow. For hill cultivation the plants are ordinarily set six to eight feet apart each way.

Having decided on the method to be employed, mark out the land to correspond, plowing good, deep furrows in one direction to receive the plants. In setting, time will be saved if three or four men can work together. Let one carry the plants in a pail of water, and drop them at the

intersection of the mark and furrow, while the others set. The roots should be well spread along the furrow, the soil drawn in over them, and firmed with the hands or feet. Ordinarily this is most conveniently done by working on hands and knees on the opposite side of the furrow from which the soil is thrown out, so that it can be quickly drawn in with the hands. In fine, mellow soil, free from stones, the planter may walk along the furrow, take the plant in one hand, and do the covering and firming with the feet, or at least enough of it to fix the plant in position and protect it from drying out, leaving the balance to be done with hoes. The furrows should be deep enough to admit of setting the plants a little lower than they previously grew, and of doing it easily. Filling in the furrow, beyond what is required to insure satisfactory conditions of growth for the young plants, can be left to follow as a matter of course in the future cultivation.

For row planting, rows eight feet apart, with plants three feet apart in the row, will be found satisfactory; this gives 1,815 plants to the acre. Occasionally a grower prefers planting as close as two feet, and others as far apart as four feet. The vigor of the variety and its suckering habit may influence this.

Intermingling varieties in planting to insure more effectual pollination is not often practiced, for most varieties are self-fertile. Varieties which have their origin in the crossing of blackberries and dewberries, such as Rathbun, Mammoth and Wilson, will be helped by pollen from other sorts. Even varieties which are self-fertile may be benefited by pollen from another sort. If more than one variety is to be grown it is both safe and wise to plant

them near together, so that whatever benefit may come from interpollination may be secured.

Intercrops may be grown between the blackberry rows while the plants are young, and are to be advised during the first season. Such hoed crops as potatoes, cabbage, tomatoes and beans are excellent. Corn, owing to its extensive root system and heavy demands upon the soil-moisture is less suitable. Strawberries are sometimes used for this purpose and should give good results the first year of fruiting. The constant tillage needed to keep the strawberry rows in place will help to push the young blackberry plants along in the way they should go. After fruiting, the strawberry plants may be abandoned and torn out with the later cultivation.

TILLAGE AND MULCHING

Little need be said on the subject of cultivation in addition to what has already been said in Chapter I. Some writers have advised no cultivation for the blackberry, at least after the second year, on the ground that cultivation produces too rampant growth and consequent lack of hardiness. While this may be true in part, the practice of letting them go without cultivating is open to an equally serious if not more grave objection. The most dangerous enemy to blackberry-growing in most parts of the country is dry weather, especially if occurring about the time of ripening. Tillage is the most available means at command, in most cases, for overcoming this difficulty. A crop may easily be reduced one-half by drying up on the bushes. While cultivation cannot entirely prevent this

loss, it will do much toward it. Thorough cultivation every ten days throughout the season is the best known substitute for irrigation, and should be vigorously maintained up to the time the fruit ripens, at least.

A cultivator which will cut the suckers below the surface of the ground is a great aid, unless plants are to be grown for sale or for further planting. Two such implements are described in the introductory chapter. A spring-tooth

Fig. 12. Tilling blackberries with spring-tooth cultivator.

cultivator, drawn by either one or two horses (Fig. 12), is a most useful tool for blackberry plantations.

Mulching proves very satisfactory where the conditions are favorable. It is especially adapted to the home-garden, where patches are likely to be small and inconveniently cultivated. There is sometimes a tendency to induce too late fall growth, and in this respect it is inferior to cultivation, for a cessation of tillage practically removes the soil-mulch, at least if rains follow soon to pack the surface.

A system of partial mulching practiced on the Thayer farms at Sparta, Wisconsin, seems to have given excellent results under their conditions, and may be worthy of more general use. The plan followed was to grow clover in a field by itself, cutting it when in bloom. It was then drawn to the berry field and applied as a mulch along the rows, the central space between the rows being kept well cultivated. Such a plan applies mulch where tillage is most troublesome and expensive. If the mulch is heavy enough, it tends to discourage weed growth and excessive sucker production in among the plants where most difficult to control. The part most easily tilled on the other hand, where tillage is simplest and cheapest, is left free to be handled in this way. A thorough mulch is more effective than surface cultivation in retaining soil moisture. Coupled with this is the additional advantage that the decay of the mulch is constantly furnishing humus to the soil. The principal objection to the practice lies in the cost of the material and its application. If cheap mulching material can be conveniently secured, the method is worthy of careful consideration.

Where clean tillage is practiced, the use of cover-crops will aid in maintaining the humus supply, and in securing air nitrogen. The crop or crops to be used for the purpose will depend largely on the nature of the climate. Crops which do not survive the winter gather less nitrogen and add less humus but are more easily managed. A strong, thrifty growth of clover or vetch in among the plants is difficult to subdue in spring. If left undisturbed it is scarcely less objectionable than weeds in its immediate effects on the berry crop.

PRUNING

Opinions differ as to the best method of pruning and training the blackberry. As ordinarily practiced in commercial work it is a simple operation, if done at the proper time. If neglected at the time when it should be done the results can never be satisfactory. The only summer pruning required is to pinch the growing cane once, at from eighteen inches to two feet from the ground. There need be no fear of pinching too low, for the cane elongates considerably after being clipped, if still young, and the result is a much better formed bush than if allowed to get three or four feet high before being cut. I wish to reiterate the caution to pinch back the canes when they get to the desired height. It makes a vast difference to the future growth of a bush whether the tip is clipped off when it gets two feet high or whether it is allowed to grow to four feet and then cut back to two feet.

At the spring pruning the laterals are cut back to from one to two feet in length. This is an operation demanding much judgment, for it is a fruit-thinning process. Too close pruning will diminish the yield, too little will allow more fruit to set than can be properly matured. Not all varieties are alike in fruiting-habit. The Taylor, one of the best all-round varieties in cultivation, does not bear fruit close to the main stem. Four to eight buds at the base of the branches usually produce no flowers. Unbranched canes often fail to develop flowers within two feet of the ground. Close pruning of this variety, therefore, will take away most of the fruit. Other varieties under observation bore flowers within three or four buds

of the main stem. Erie is said to behave like Taylor in this respect and Early Harvest is said to bear its fruit-buds near the main stem at times and near the tips at others. It is, therefore, better to defer spring pruning until the buds develop, unless the grower is sure of his ground.

While the above method is the one commonly followed in field culture in the eastern states, other methods are more popular in some localities. Where soil and climate tend to produce a very tall and strong cane, it is a common practice to allow them to grow in their own way but to provide some kind of support to hold them up. The particular advantage claimed for this method is that it permits full exposure of all buds and leaves to sun and air, with the result that larger and finer crops of fruit are produced. The argument seems reasonable and perhaps explains why the method is apparently more popular in moist localities where sunlight in less intense. The chief disadvantage lies in the extra labor involved in providing support and securing the plants to it.

The most common support is some form of wire trellis. The simplest type consists of a single wire stretched to posts set in the row. This wire is put three to five or six feet from the ground depending on the height to which the canes ordinarily grow. A low wire is sometimes used, even where the growing canes are tipped to induce branching but such plants usually stand up well without support. Sometimes two wires are used, one above the other, where canes grow very tall. For a good illustration of trellis-grown blackberries, see frontispiece.

A modification of this trellis, with either the single or

the double wire, consists in nailing cross-pieces to the posts and fastening the wires to these, 18 or 20 inches apart. The canes are then trained up between the wires, being thus supported without tying.

Trailing varieties are trained like dewberries except those of the evergreen type (*Rubus laciniatus*). The canes of this class do not die each year, after fruiting, as do those of our common varieties. Old wood continues to live and bear fruit from year to year if allowed to do so. The plants should therefore be trained in much the same manner as grapes, for young canes produce the best fruit. Pruning away surplus wood is delayed until winter in order not to stimulate the growth of laterals.

The old canes of ordinary varieties are best removed as soon as through fruiting, while they are more easily cut, thereby disposing of whatever fungus spores and insects may be harboring about them.

HARVESTING AND MARKETING

Despite the thorny character of the bushes, blackberries are among the easiest gathered of any of the small-fruits. The fruit when well grown is large, and easily and rapidly picked. A word of caution may be needed in regard to two things. The first is never to leave the fruit in the sun after being picked, as a few minutes' exposure to hot sunshine will turn it red and render it more or less bitter and unpalatable. The next point is not to pick it until ripe. The cultivated blackberry has been greatly misjudged in the matter of quality because the fruit of many varieties turns black before it is ripe. The

result is, that oftener than otherwise the berries are picked green, and consumers, supposing them to be ripe because they are black, growl because they are sour or sometimes bitter. For distant markets this cannot be wholly avoided, as the fruit must be picked while still firm, even at the expense of quality. For home use, if left till the bees begin to eat them, there will be no cause for complaint at the quality of the cultivated blackberry. In commercial work much attention must be given to this point. If picked while still firm, the fruit handles and carries well. If left until fully ripe and beginning to soften, the ideal condition for immediate use in its fresh state, it will quickly spoil on the market. A blackberry when first turned is a very firm fruit, when fully ripe a very soft one.

The fruit is marketed either in pint or in quart baskets, as best suits the fancy of the selected market. The blackberry is a fruit which usually meets with a ready sale at good prices, and one which handles well. Many small inland towns and villages consume very considerable quantities of the fruit at prices which are eminently satisfactory to the grower. In localities where wild fruit is abundant the demand may be limited.

USES

The blackberry is primarily a table fruit for immediate consumption, either in its fresh state or in the making of pies, puddings and the like. Heating changes its flavor and color materially. This is a change rather than an injury, however, for by many the cooked product is preferred to the uncooked. The fruit therefore lends itself

readily to home canning and is largely used in this way. It also affords excellent jams and jellies.

In the commercial canning industry, the blackberry now holds a much more important place than formerly. According to Darrow [1] the introduction of the lacquered-tin can has had much to do with the increased use of this fruit among canners. Ordinary tin is said to discolor the fruit when it comes in contact with it. Canners are able to use large quantities of wild and other low-grade fruit, which might otherwise go to waste.

Dried blackberries are nearly always quoted in market, yet, so far as known, are not grown for that purpose, the supply coming almost wholly from the South, where the wild berries are gathered and are dried in the sun. They are usually poor in quality, and quoted at a price which would render it unprofitable to dry them if there were a market for fresh fruit. In order to learn something of their adaptability for this purpose, eight well-filled quart baskets just as we were selling them fresh, were taken for experiment. They were made to correspond in weight, so that each quart, with the basket, weighed one and one-half pounds. Deducting the weight of the baskets left five pounds ten and one-half ounces of fruit in each of two lots of four quarts. Granulated sugar was freely sprinkled over one lot. Four ounces of sugar was thus used, one ounce to each quart, making the weight of this lot plus the sugar, five pounds fourteen and one-half ounces. Both lots were put in the greenhouse to dry August 3, on wire screens, and covered with mosquito netting to keep away the flies. After one or two days of

[1] Farmers' Bulletin, No. 643.

sunshine, there came several cloudy ones, and the berries began to mold, so that the netting had to be removed. Those treated with sugar molded less than the others, and stuck to the screens less in drying. August 12 both lots were taken up and weighed. They appeared to be as dry as raspberries usually are when put into the curing room, but quickly began to mold again when put in a pile together. The four quarts dried without sugar weighed at this date one pound ten and one-half ounces. The four quarts dried with sugar weighed one pound fifteen and one-half ounces. From these weights, it appears that not over twelve to fourteen pounds of dried fruit to the bushel can be expected. The weight of sugar applied seems to be retained, and possibly increases the weight slightly in addition, by retaining more of the juices of the fruit. Those treated with sugar seemed to remain in a softer and better condition for cooking. Judging from this attempt, the blackberry dries very slowly, and under present conditions, at least, there seems to be little promise that it can be profitably grown for evaporating purposes. The quality of dried blackberries is low. They seem to be lacking in sugar and pronounced qualities.

The value of the blackberry in household uses is not fully appreciated. Ancient writers were inclined to lay great stress on the medicinal qualities of all plants and fruits, and while we are wont to smile at many of the supposed virtues there recorded, we might well profit by studying more closely the uses and virtues of the blackberry. The value of blackberry wine or brandy in bowel troubles is well known. It is reported that blackberries preserved in one of these forms were found by army sur-

geons to be the only sure and sovereign remedy against chronic diarrhœa, proving effectual whenever taken in time, even after all other medicines had failed. If the previously prepared wine or brandy is not available, the water from blackberry roots freshly dug and steeped, will usually serve the purpose equally well. This, though an old-time household remedy, has lost none of its effectiveness with the passage of time.

Various recipes are given for the manufacture of wine, one of which is quoted from an early edition of "The Gardener's Monthly." "Express the juice through a thick cloth, to prevent any pulp mixing with it. To one quart of juice add two quarts of soft water (cold) and three pounds of sugar. Let it then stand in a wide-mouthed vessel, until fermentation ceases, which will be sometimes after two months. Be careful while fermentation is going on to keep the film skimmed clear from the top of the liquid daily, and to keep the vessel full to the top. A small vessel of the liquid should be kept for filling up the large vessels as the skimmings are removed. When fermentation ceases, strain the wine into bottles. The wine keeps better in large quantities, and to that end put it into large stone jugs, corking and sealing them."

Another recipe adds a quart of boiling water to every gallon of the crushed fruit, before expressing the juice, instead of adding cold water afterwards. It also adds the white of eggs beaten to a froth and stirred into the juice; spices are also enclosed in a cloth bag, and dropped into it.

Formerly there was a market for good blackberry wine for medicinal uses, at $2 to $3 a gallon, and if a glut of fresh fruit occurred, it could be turned into wine to good

advantage. In recent years this seems to have been largely replaced in practice by other medicines and stimulants, and there is little demand for it.

Probably the greatest value of the blackberry is not so much as a medicine to cure disease, as in its healthfulness when used as a food. Perhaps nothing is more conducive to health and good spirits than fresh, well-ripened fruit, and among all fruits there is none better adapted to accomplish this much wished for end than the bright, shining, and luscious blackberry. No home should be without it in abundance.

LESSENING THE EFFECTS OF DROUGHT

Blackberries ripen at a season of the year when soil moisture is likely to be much depleted. Hot suns and drying winds are making heavy demands on the plant which in turn seeks this moisture from the soil. The plants carry a heavy crop of fruit which must be refined and perfected just when weather conditions, in the average season, are at their worst. All these conditions tend to make droughts one of the most important factors with which to be reckoned in blackberry growing. It therefore seems wise to discuss the methods which may be used to reduce the injury from this cause.

The character of the soil and its drainage are matters of first consideration. Dry sandy or gravelly soils should never be chosen. No soil which lacks moisture is suitable. Neither will a wet soil do; one which is deep and continually moist but not wet is the ideal. Artificial drainage will sometimes be needed to secure the desired result.

The exposure of the field to sun and wind will affect the amount of water which the plant takes from the soil. Evaporation is dependent on sunlight, wind velocity and atmospheric humidity. The latter factor cannot be controlled, but a northern exposure and protection from prevailing winds by natural or artificial windbreaks will influence the others.

The next need is so to fit and prepare the soil, by its previous treatment, as to embody in it the greatest possible amount of decaying vegetable matter (humus). Some material always rotting in the soil should be the aim. This, more than any other one factor, will help the soil to store up moisture for that trying time when it is so much needed.

The soil preparation should be deep and thorough. Water must often be taken up quickly or lost. Good tillage, both before and after planting, helps to bring this about.

The amount of plant-food in the soil may greatly influence the effect of drought. Experiments have shown that plants growing on a soil lacking in plant-food, require many more pounds of water to produce a pound of dry matter than when growing on a soil which is rich. Apparently the soil solution from the poor soil is weaker and more is needed. This point should not be overlooked.

Frequent surface tillage or thorough mulching, together with keeping down weed growth, are the most available methods for preventing the waste of soil moisture during the growing season. Two lines of effort are open in dealing with the moisture problem. The first consists in putting the soil in condition to store up moisture; the

second in preventing the waste of that moisture. Tillage and mulching have to do with the latter.

Pruning may also influence the effect of drought. By it the amount of fruit which the plant will carry is largely determined. If given too heavy a load the plant is unable properly to develop it all in a dry season. The method of training used may also have some influence.

DURATION OF PLANTATIONS

The profitable duration of a blackberry plantation, as with all other small fruits, depends much on care and management. They generally last longer than black raspberries, perhaps from five to ten years on the average, longer in special cases. Attempts to lengthen the lifetime of a fruit plantation of any kind are rarely profitable. It is better to force the plants to do their best, get what can be gotten from them before they begin to decline, then let them go, to be replaced by others. If by one system of management a plant can be induced to produce as much in three years as it ordinarily would in five, the three-year return is to be preferred, even if at the end of that time the plant is exhausted and no longer profitable. Others are ready to take its place, on other ground, and to continue the high-pressure production. The greater the yield, within limits, the greater the profit and the more fun to be had from the business.

REMOVING THE PLANTS

When a plantation has passed its usefulness it may become a difficult task to get rid of it. The capacity of

the plants for throwing up shoots from broken roots is then brought into full play, and they make a vigorous fight for life. A good method of exterminating them is to mow off and burn the bushes, then plow deep, directly after fruiting. Thorough harrowing with a spring-tooth harrow will tear out many of the stumps. From that time, all shoots should be kept down by some system of cultivation which will cut them off below the surface of the ground. Replowing some two months later will often be found a help. While some shoots may appear the following year, with this system of treatment they will cause no serious trouble in the cultivation of ordinary crops. If the land is to be used for fine or delicate crops, the stumps will need to be removed.

HARDINESS

Since the difference between a full crop, with good profits, and no crop, with utter loss, may depend on hardiness alone, this is a matter of no little importance. In the climate of central New York varieties like Brunton's Early, Topsy, and usually Wilson's Early and Wilson Junior, generally kill to the ground every winter, while Taylor, Agawam, Stone's Hardy, Snyder, and so on are slightly or not at all injured.

In many parts of the West and Northwest, as Colorado, Nebraska, Iowa, Minnesota, and the like, no varieties prove hardy without winter protection and, curiously enough, the matter of selection for hardiness becomes of less import there than in milder climates. The ability to endure summer heat is there the important consideration.

If plants are to remain unprotected during the winter, the selection of varieties should be largely influenced by the question of hardiness. The method of protection is described in the introductory chapter.

YIELDS

Blackberries generally yield better than other members of the bramble family. Not only do they yield well when growing wild among the rocks and woods, and even under worse conditions which may sometimes pass under the name of cultivation, but they respond promptly and generously to liberal care and attention. In answer to a request for an estimate of what each considered an average yield to the acre of blackberries, fifty growers in different parts of the country gave replies varying from 1,280 to 10,000 quarts, the average being 3,158 quarts, or over ninety-eight bushels to the acre. These figures, obtained from practical growers, are worthy of credence. Some of the estimates are very high, but others are extremely low, and the average is considerably below the yield which many good growers are securing. It is safe to say, therefore, that any grower whose yields fall much below this average is not living up to his possibilities, and unless some uncontrollable disease or insect is preying upon his plantation, there is something wrong with his system of management, or his location is unfavorable.

A point which those engaged in all lines of agricultural production need to appreciate, is that the bulk of any crop is required to defray the actual cost of production, and that profit lies only beyond this limit. As an

illustration, suppose that by ordinary methods of cultivation an acre of blackberries produces seventy bushels, and that sixty bushels are required to repay the cost of production. Now, if by judiciously increasing the cost of production to seventy bushels, by more liberal fertilizing or better cultivation, we can increase the yield to ninety bushels, the profit is doubled. Nor does this fully express the difference, for with an additional expense equivalent to ten bushels, we have secured an additional profit of ten bushels, and the additional outlay has paid a return of one hundred per cent on the investment, while the first ten bushels only pay sixteen and two-thirds per cent on the investment. In other words, one acre under the second management is better than two acres under the first, for it is equivalent to growing the second acre with an outlay equal to only ten bushels, instead of an outlay equal to sixty bushels.

It should be remembered that soil and climate play an important part in returns. To secure a yield of 5000 quarts under some conditions is easier than to secure 3000 quarts under other conditions. The lesson of adaptation is one not easily learned. Many growers are struggling along with meager returns because they are dealing with an unproductive soil, or because they are trying to bring about something for which the locality is not well adapted. The blackberry is not a fruit which is universally successful. In some localities its culture may prove very successful as a commercial undertaking, in others very unsatisfactory. The question of adaptability should be one of the first points to determine.

PROFITS

To foretell profits in farming operations is a difficult undertaking. The facts involved are too variable. Few growers keep records, or know what their crops cost. Of those who do, not many put the results in print. Suggestions must, therefore, be chiefly in the nature of estimates. While intended to be fairly reliable for average conditions, they may be far afield for any given farm or crop. The following figures may be taken as a rough estimate of the cost of production per acre under ordinary farm conditions.

FIRST YEAR

Rent of Land	$ 5.00
Plowing and fitting the field	5.00
Plants	15.00
Planting	10.00
Fertilizer [1]	20.00
Tillage and care	10.00
	$65.00

[1] Under some conditions this may be omitted altogether the first season.

It is customary to consider that part of this cost is offset by the return from crops planted between the rows the year the plants are set. Whether this should be done, depends chiefly on the point of view. Something can be secured from the land by the use of inter-crops, and it is generally wise to use them. Yet it should be remembered that the crop would have been larger and would have been

produced at less expense to the unit if it had occupied the entire ground. It may be as appropriate to charge to the blackberries the additional yield of the crop which might have been produced, as to credit them with what was obtained. The reader may choose his own method of figuring.

At least four profitable crops of fruit may be expected from the plantation. It will therefore be appropriate to apportion this first year's outlay to these crops. The cost for subsequent years, exclusive of picking and marketing, may then be estimated somewhat as follows:

Proportion of first year's expense	$16.25
Rent of land	5.00
Fertilizer	20.00
Cultivation and hoeing	10.00
Pruning and removing old canes	10.00
Total	$61.25

The partial crop, which may be expected the second year, should about meet expenses. After the first year, it is fair to assume that an average of 3,000 quarts to the acre should be secured, with favorable soil and climate. The profit will then depend on the net price a quart which it is possible to secure, after meeting the expenses of picking, packing, and marketing. With a net price of five cents a quart the profit would be about $90 an acre, with the cost of production as assumed above.

In connection with these figures, is presented the following close estimate at one time made by M. A. Thayer, of Sparta, Wisconsin. They serve to show what it is pos-

sible for a thorough-going, energetic man to do under special conditions, and with methods worked out and adapted to his own needs.

ONE ACRE—FIRST YEAR

Plowing ground	$ 1.50
Harrowing five times	2.50
Rolling and marking	1.00
2,000 Ancient Briton plants	40.00
Setting plants	7.50
Cultivating ten times	3.75
Hoeing six times	6.00
Laying down for winter	2.50
First year's expense	$64.75

SECOND YEAR

Taking up plants in spring	$ 1.25
400 new plants to replace dead ones	8.00
Setting 400 plants	2.00
60 posts at six cents	3.60
270 stakes at two cents	5.40
380 rods No. 12 wire	12.60
Setting posts and stakes	5.00
Stringing wire	2.50
Cultivating ten times	3.75
Hoeing four times	4.00
Two loads clover mulching	8.00
Placing clover mulching	3.15
Pinching-back	2.50
Laying down for winter	7.50
Use of tools, etc	6.00
Total for two years	$140.00

After the second year the annual expense is estimated as follows:

Taking up plants in the spring	$ 2.50
Cultivating and hoeing	8.00
Mulching	12.00
Nipping-back and trimming	5.00
Laying down for winter	7.50
Tools, etc	5.00
	$40.00

The estimates for labor are made on the basis of paying $1.25 a day for men and $2.50 a day for a man and team. The system of mulching, as elsewhere explained, consists in growing clover on separate pieces of ground, cutting and spreading it green along the rows, and cultivating the center. The expenses of gathering and marketing, Thayer places as follows:

Picking per quart	$0.01½
Boxes and cases	01
Packing and selling	01
Total expense per quart	$0.03½

Thayer admits that these figures show a high cost of production, but feels confident that any reduction means diminished profits, therefore is not to be permitted. This method of treatment gave over 2,000 bushels from ten acres of the Ancient Briton variety in one year. This is a remarkable yield, but the average on those farms is unquestionably far above that of most growers. Thayer

concludes that under their conditions at that time, a yield of 200 bushels an acre gave a net profit of nearly $250 an acre, while 100 bushels an acre would give about $80 profit, and fifty bushels to the acre little or no profit at all.

Instances are common of admirable yields during a single season. One grower in a small town in central New York sold $500 worth of fruit from half an acre in a recent year. It should be firmly fixed in mind that all such results are exceptional, and no one should use them as a basis for average profits.

It may safely be said, however, that with a good market, good management, intelligence and skill, both in growing and marketing the fruit, a profit of $100 an acre can be expected with a fair degree of certainty under conditions of soil and climate which will warrant the growing of blackberries as a commercial venture.

THE EVERGREEN BLACKBERRIES

Mention should be made of the evergreen type of blackberries grown in some localities on the Pacific coast. These are so different in habit that the methods of treatment demanded have little in common. The leaves of the plant are much divided, which accounts for the name cut-leaved blackberry, which is often applied to it. The thorns are numerous, strong and recurved, making it a troublesome plant to handle. The chief difference between this species and the common blackberries lies in its long trailing habit of growth and in the fact that the canes live from year to year. These canes grow upright for a

short distance then bend over and trail along the ground, reaching a length of 25 to 50 feet.

A method of handling which is found satisfactory is to set the plants in rows eight feet apart, and from eight to sixteen feet apart in the row, according to variety. The Himalaya and Mammoth varieties are more rampant growers than the Evergreen. A trellis is provided with two wires, which are placed from three to five feet from the ground. The growing canes are first trained along the lower wire, two or three in each direction. They are bent gradually and carefully tied as they grow, the aim being to prevent the growth of laterals as much as possible. In winter or spring, these long canes are cut back about one-third. Bearing shoots are thrown out along the remaining part as in the Kniffen system of grape training. The plant is renewed from year to year much as are grape vines. The new canes are usually trained along one wire and the fruiting ones along the other.

Under favorable conditions, plants of this type are said to yield much better than ordinary kinds. The fruit is said to be firm and to bear shipping well. Himalaya and Mammoth are reported as ripening shortly after the loganberry and about with Kittatinny and Snyder, the Evergreen later.

Varieties of this type have been tried from time to time in the eastern states but seem never to have shown any value except in limited areas along the Pacific coast where soil and climate suit their peculiar needs.

The Mammoth, at least, is more properly classed as a dewberry, and is discussed under that head.

CHAPTER V

THE DEWBERRIES

The dewberry as a cultivated fruit has been a relatively recent introduction to American horticulture.

At the summer meeting of the Fruit-Growers' Society of Western New York, held June 24, 1863, James Vick described the dewberries grown by Dr. Miner, of Honeoye Falls, New York, and his method of training them. This was the same as the present method of tying the fruiting canes to stakes about five feet high, and allowing the new growth to run at will, most of which will root at the tips. He was growing two varieties, one of which was some ten days earlier than the other. Mention is made of the fact that the berries of the earlier variety were sometimes imperfect, "a common fault with the dewberry." The other variety appeared to bear uniformly perfect berries.[1] From a later mention of these varieties [2] it seems that they were sent out by Dr. Miner to some extent, but there is no evidence that they ever received varietal names, and therefore they were probably soon lost to cultivation.

It appears that the Bartel was the first named variety introduced. The originator's account of this, together with directions for its management, were given in Purdy's Fruit Recorder for 1875, p. 182. It does not appear to

[1] Hovey's Mag. of Hort. 1863, p. 319.

[2] Ibid, 1868, p. 286.

have become very generally known at that time, for in 1879 the editor of "The Gardener's Monthly" writes,[1] "Of true dewberries, no improved kinds are known under culture." In a previous number of the same volume, however, N. H. Lindsay, of Bridgeport, Connecticut, is reported as having cultivated two kinds of wild dewberries in a small way for home use, taking plants from the woods. It seems that even he did not know how to propagate them, although a nurseryman and presumably an experienced propagator.

Even as late as 1884 the editor of "The Country Gentleman" says (page 329): "We are not aware that the dewberry (or running brier) is cultivated for sale by any nurseryman. . . . The wild dewberry is often found along neglected fence-rows or in rocky or sterile fields, from which, if desired, it may be transplanted to gardens, and treated like garden raspberries." These statements serve to show how recent is the cultivation of the dewberry in anything like a commercial extent. It was not until the introduction of the Lucretia, which was brought into general notice about 1886, that the dewberry began to occupy any prominent place in American horticulture.

So much for the history of the dewberry. But what of its future? Is there a place for it among our garden fruits; and, if so, will it be able to fill that place as it should? Coming, as it does, so early in the season, before the first blackberries are ripe, it is more desirable than it otherwise would be. Until improved by breeding and se-

[1] Gardener's Monthly, Vol. 21, p. 150. See Bailey, Bul. 34, Cornell Exp. Sta., for a sketch of dewberry history; also "Evolution of our Native Fruits."

lection it can hardly fill the place which its co-laborers in the garden are ready to accede to it. Unless it can be induced to correct some of its bad habits and overcome its failings, the place is even yet likely to be taken by some young, vigorous and early-ripening blackberry. One serious though excusable fault of the dewberry is its thorniness. While lack of fertilization and consequent production of imperfect fruit can hardly be denied as a family trait, it is no doubt true that the more productive members have suffered unjustly, owing to the behavior of the rogues of the household. There is no disputing the fact that stock of the Lucretia dewberry, as sold about the country, has been badly mixed. As received and grown at the Cornell gardens, it comprised two distinct sorts, one with small blossoms, more delicate growth, and small, imperfect and worthless fruit; the other with large blossoms, vigorous growth, large, plump and glossy fruit. The cuts (Figs. 13 and 14) well illustrate the difference between these two types, which is in itself a ready explanation of many of the conflicting opinions regarding the Lucretia.

By taking the best of what we already have as a basis for future improvement, there seems to be no reason why the dewberry may not be brought to such a state of perfection as shall render its place assured. In the Wilson's Early and Wilson Junior blackberries we have a type intermediate between the dewberry and the blackberry. This form may suggest lines of breeding which in time shall produce offspring superior to anything which we now have, either in the blackberry or the dewberry. We need more careful and skillful breeders, who shall breed

Fig. 13. Lucretia dewberry from a good plant.

Fig. 14. Lucretia dewberry from a poor plant. One-half natural size.

plants as understandingly as animals are bred, and who shall give us in the results of their toil the fruit treasures which ought ere this to have been ours.

In this particular field of endeavor the Pacific coast has outstripped the East.

SOIL FOR DEWBERRIES

The dewberry is generally found on poor or sandy soils the country over. This is an indication that comparatively light, sandy soils will prove best adapted to its cultivation, and the general experience of growers seems to substantiate the supposition. It is true that instances are reported of success from nearly all kinds of soils, but the best results nearly always come from planting on comparatively light, sandy ground.

LOCATION

The location will doubtless prove to be as important as with any other fruit, when the culture of dewberries comes to be better understood. In parts of the West, the Windom has been found to give better results in shady locations, the finest berries being found even in dense shade. Because of its habit of growing on dry, sandy ground, location to avoid drought may not be so important as with the blackberry, but any location, like a cool northern exposure, which will tend to mitigate the hot, scorching sun, will undoubtedly prove beneficial.

FERTILIZERS

Thus far the necessity for fertilizers has hardly been made apparent, and it is doubtful whether at the time of planting they will often be needed. If plants bear as they should, the addition of plant-food later may be expected to be of service on many soils. The same principles which apply to the feeding of blackberries may be expected

to hold. On average soils the demand for nitrogen is likely to be small.

PROPAGATION

The dewberry propagates naturally from tips, like the black raspberry. If increase of plants is important, these tips should be buried when their growth is about completed. Covering the whole cane to induce rooting along its entire length would seem to be feasible, if speedy methods are desired. Such a cane cut into pieces should form many plants; and the prostrate habit of the plant would favor such a method.

Dewberries can also be propagated by root-cuttings, the same as blackberries. The method for doing this is explained in the chapter on blackberries. Since it is a general rule that those plants which naturally propagate by suckers also propagate most easily by root-cuttings, a little more care may be demanded, and a larger percentage of failure may be expected than with blackberries.

PLANTING

The same general rules given for the planting of the blackberry will apply to the dewberry, except that the furrow to receive the plants need not be quite so deep. The distance apart at which they are to be placed will be largely determined by the method of training to be employed. If to be trained to single stakes, four feet apart each way will be satisfactory; if to wire trellises, six feet by perhaps three feet in the row will be more convenient. If to be trained on low, flat, slat or wire trellises, even a greater distance between the rows will be needed. This

method demands more space for training the plants than is needed for their maintenance.

The tendency of dewberries to fail to set fruit altogether, or to produce small and imperfect fruit, is a point which should be taken into consideration when planting. There is reason to believe that this is often due to a lack of proper fertilization. Whether this lack of fertilization comes from insufficient pollen, or from lack of potency of the pollen which reaches the stigma, is uncertain. Whatever the cause, the lack is apparent, and the most feasible way of overcoming it is by planting different kinds together. It has been conclusively shown that the pollen of many varieties of our larger fruits, notably pears and apples, has not the power to properly fertilize the pistils of the same variety. The same may be true of the dewberries. At any rate, better results seem to have come from planting more than one kind together. Even blackberries planted alongside have seemed to produce a favorable effect in some cases. One instance is reported [1] where dewberries blossomed full for several years, but produced only a few imperfect berries. Later a block of blackberries was planted beside them, and when these came into bearing, the dewberries began fruiting, and continued to do so regularly. This is an indication, though not proof, that blackberry pollen may fertilize dewberries.

TILLAGE

Little need be said concerning the tillage of the dewberry. Some growers even advise letting the plants grow

[1] Trans. Ill. Hort. Soc., 1886, 382.

entirely without cultivation or care. This method can hardly recommend itself, unless it be on some rough, uncultivable and otherwise unutilized piece of ground. As the season advances, the young canes spread out over the ground and tend to interfere with cultivation. It is only necessary to direct them along the row, like strawberry runners, however, and continue the cultivation but one way, if the plants are so set as to admit of cultivation both ways earlier.

PRUNING AND TRAINING

Very little pruning is required. Simply to shorten the canes when they are tied up in spring, if too long, is all that is necessary, unless there is a tendency to produce too many canes, when all but four or five should be removed. With any careful system of cultivation some method of training is essential. Various plans have been recommended from time to time, only part of which are here mentioned.

One plan consists of a low, flat trellis, of greater or less width, eight or ten inches from the ground, on which the plants are allowed to run. This may be a narrow one of wire, made by driving stakes into the ground, ten or twelve feet apart, and nailing strips of boards a foot or more long, across the top. On these cross-strips wires are drawn tightly, one at each end and usually two between. Another way of reaching the same end is to fasten pieces of boards to stakes, running the boards lengthwise of the row, one on either side, and nailing slats across between them. Such a low, flat trellis raises the fruit off the

ground and keeps it clean, but picking is inconvenient and cultivation is more difficult.

A second plan consists in training to an upright wire trellis, after the manner of grapes. The young canes are allowed to run on the ground, and are tied up to the wires the following spring. This is a very satisfactory method, although it admits of cultivation only one way.

A most simple and satisfactory plan is the one which was recommended by A. J. Caywood as early as 1888.[1] Let his own words explain it:

"I plant them as I do red raspberries, four feet apart each way, cultivating both ways until the fore part of June, when the renewals get too long to do so. We then direct the renewals of each row along the bottoms of the hills, and cultivate the other way as long as required, and one man has done the directing of our patch in a day. The old canes are taken from the stakes any time after the fruit is off, before tying up in the spring. The renewals are left on the ground all winter, which is sufficient protection here, but if it is necessary to protect them in colder regions, their prostrate position facilitates the work.

"In the spring, one draws the entire hill from under the other hills in the row, and holds them to a stake, while a boy ties them tightly. This can be done as rapidly as tying red raspberries. I think my patch was the first managed on this plan. We have tried the windrow system, but like staking the plants better."

If the old canes are cut away as soon as through fruiting, the young ones can then be tied to the stake until

[1] Popular Gardening, Vol. IV, p. 33.

winter, and cultivation go on unimpeded. This may favor a better development and maturity of the canes than when they are allowed to run on the ground.

HARVESTING AND MARKETING

Whatever applies to the harvesting and marketing of blackberries will apply equally well to dewberries, except that, coming earlier, they have the market more nearly to themselves. The vines are viciously thorny, and the fruit apt to be so concealed within them as to render the picking difficult and painful. Training the plants to a stake or trellis will in part obviate this difficulty.

The fruit carries well, and can be put into market in good condition. Like many of the blackberries, though perhaps in a more marked degree, it has the habit of turning black before it is ripe. If picked then it is sour and undesirable; for home market it should be allowed to get thoroughly ripe before being gathered.

DURATION OF PLANTATIONS

Dewberries persist well in the soil, sometimes too well, for after they have served their purpose, it is often difficult to get rid of them. They seem often to be unproductive for the first two or three years, afterward coming into more uniform and prolific bearing, and continuing in many cases for a number of years.

KILLING OUT THE PATCH

When it becomes necessary to rid a plot of ground of them, vigorous measures must be adopted. While they

do not propagate naturally by suckers, yet when the roots are torn and broken, pieces which are left in the ground have a remarkable ability for bursting forth into plants. The method advised for destroying the blackberry is the best that can be recommended for killing off dewberries; namely, mowing and plowing directly after fruiting, frequent cultivation afterwards, and replowing before winter.

HARDINESS

The inherent hardiness of the dewberry may not be equal to that of many varieties of the blackberry, yet its habit of growth tends to afford it protection which enables it to withstand the cold of winter, in most cases, as well as the blackberries. If not entirely hardy in some localities, the ease with which it can be protected in winter is certainly a point in its favor. The older canes will naturally be cut away before winter, and in any event the protection of them is of no benefit. The young canes, which lie directly on the ground, and which have been trained along the row in cultivating, are in the most convenient position possible for being covered with soil or mulch. In parts of the country where all kinds must be protected to give profitable results, this is really a point of considerable importance in favor of the dewberry.

YIELD OF DEWBERRIES

The yield to be expected is one of the moot points in dewberry culture. There is the greatest possible diversity in reports, some growers finding it highly satisfactory,

while others are disgusted with it. Much of this diversity of opinion, and much of the failure to secure good results is, without doubt, due to the mixed and inferior character of many of the plants which have been sold. Even where they succeed, they have not been grown very extensively, as a rule, and any reliable estimate of an average yield can hardly be formed.

PROBABLE PROFITS

With the question of yield so much in doubt, the question of profit must also be unsettled. It may be said, however, that those who succeed in obtaining a good yield nearly always find them profitable, owing to their season of ripening and consequent high price.

THE WESTERN DEWBERRIES

On the Pacific Coast, varieties of the dewberry class have attained great commercial importance. The Evergreen blackberry (see page 117), owing to its habit of growth may be readily classed among the dewberries. But the loganberry and the Mammoth, seedlings of the native western dewberry (*Rubus vitifolius*), have become most prominent. Both of these varieties were originated by Judge J. H. Logan of Santa Cruz, California, from seeds of the western dewberry taken from plants growing beside an old variety of red raspberry and the Texas Early blackberry. This blackberry is an upright species which in the mild climate of California, possesses the characteristics of an evergreen.

The loganberry has been thought to be a hybrid between the western dewberry and the European red raspberry. The fruit is large and early, ripening from about the middle of May to the first of June, according to locality. On its surface the berry appears like a raspberry and its color is a bright glowing red, which changes to a dull purplish red when fully ripe. It has a core, and parts from the calyx like a blackberry. The plant possesses all the characteristics of the wild dewberry, but is even more vigorous. It roots at the tips and never throws up suckers. It bears heavily, as much as twenty-five pounds having been gathered from a single plant. The fruit is of good quality and popular, having reached much commercial importance. Phases of dewberry culture are illustrated in Plates IV and VI.

While very successful in the far West, especially in southern California and the central Coast Region, the loganberry does not thrive in the East. Its growth is easily stimulated by warm weather, then is killed by succeeding cold weather. Even if the plant survives the winter the blossoms are likely to be caught by spring frosts.

Judge Logan believes the Mammoth dewberry to be a cross between the dewberry and the Early Texas blackberry. Its fruit is similar to that of the wild dewberry, except in size, being very large, sometimes reaching a length of two and one-half inches. It is jet black in color, less acid than the loganberry, and ripens some two weeks later. It is described as sweet and delicious when thoroughly ripe, better than the loganberry for eating raw, but less desirable when cooked and utterly insipid in

Plate IV. Loganberries in bloom.

shortcake. The plant is a rampant grower. Judge Logan tells of a plant on his grounds which grew in one season, one cane with one hundred and forty-nine feet of fruiting wood. It produces heavily in the land of its origin and is an important fruit along the coast. Apparently it does not thrive in the eastern states.

CHAPTER VI

MISCELLANEOUS BRAMBLES

While raspberries, blackberries and dewberries of the types which we have described in the foregoing chapters are the only brambles of much commercial importance in this country, there are nevertheless a few outlying types to which we may profitably give attention.

THE ORIENTAL RASPBERRIES

At least four species of oriental or Japanese raspberries have found their way into the United States, the best known probably being the one reintroduced a few years ago under the name of Japanese wineberry. They have proved less valuable than many other Japanese fruits, and have little to recommend them. They are not likely to become popular nor to be grown to any great extent, though two of them have some value as ornamental plants.

The mayberry (Japan golden mayberry).—This was raised by Luther Burbank, of California, and is said to have been produced from seeds of *Rubus palmatus*, a Japanese species, crossed with the Cuthbert raspberry. It is claimed to produce a bush six to eight feet high, bearing numerous large white blossoms, which are followed by "large, sweet, glossy, golden, semi-transparent

berries," which ripen in advance of strawberries. It appears to have developed little value as yet. The writer was unable to make this plant live in Nebraska some years ago.

The strawberry-raspberry.—This peculiar fruit belongs to a species found wild in Japan, China and the East Indies, and known to botanists as *Rubus rosæfolius*, or to a closely related species, *Rubus illecebrosus*. It has been commonly referred to in horticultural literature under the name *R. sorbifolius*, but this appears to be only a synonym of the latter name. The double form of this same species has been long known as a greenhouse plant, cultivated for its flowers, though apparently but little grown. As recently introduced from Japan under the name strawberry-raspberry, it is of interest chiefly as a curiosity, and may be worth growing for that purpose or as an ornamental plant. It is herbaceous in our climate, dying down to the ground each winter and springing up from the roots in spring. It throws up innumerable suckers, making a perfect mat of bright colored foliage. The leaves have a central stalk with five to seven opposite narrow leaflets, and are really very pretty. The mat of plants is so dense that it will keep down nearly all weeds, and the plants continue to bloom and fruit throughout the greater portion of the season. The blossoms are white, pretty and sweet-scented, and the berries bright and showy, a clump of the plants making an attractive bed. It is unproductive, and the fruit in its fresh state is rather unpalatable, varying from sour and insipid to somewhat bitter. When cooked, however, it is said to develop a pleasant flavor midway between the strawberry

and the raspberry, and to give a brilliant, rich garnet color to the syrup.

The wineberry (Japanese wineberry).—This is a raspberry which is found wild in the mountains of central and northern Japan. Its botanical name, now well known, is *Rubus phœnicolasius.* It forms a bush three to seven feet high, with somewhat spreading and rambling canes, which are thickly covered with bright red hairs and weak prickles, standing out at right angles to the stem. The leaves are light green and whitish below. The flowers are very small, white, with large, hairy, viscous sepals, which close over the fruit again after blooming and keep it entirely covered until about ripening time, when they again open. The berry is then white, but turns bright red within two or three days, becoming sweet and agreeable; said to be somewhat intermediate in flavor between the red and the black raspberry. Seeds were sent from Japan to J. T. Lovett, in the summer of 1887, by C. C. Georgeson. In 1889 the stock raised from this seed was sold to John Lewis Childs, who introduced it under the name of Japanese wineberry.[1] The berry is of good size, firm and handsome, and owing to its peculiar covering is exempt from insect attacks. It has not shown any real commercial value in the United States, being generally tender and unproductive. It is a peculiar and attractive plant, and well worth growing as an ornamental. It had been known in this country and sold under its true botanical name by Ellwanger & Barry, and perhaps by other nurserymen, long before its dissemination by Mr. Childs. It was described in "The Gardener's Monthly" for

[1] Amer. Gar., 1891, 204.

Fig. 15. *Rubus cratægifolius* (×⅔).

January, 1880, and received soon after by the editor, Thomas Meehan, under the name *Rubus Hoffmeisteriana.*

The Chinese raspberry (*Rubus cratægifolius*) (Fig. 15).—This raspberry possesses little value as a fruit-producing plant, but makes a handsome ornamental shrub, and is well worth growing for that purpose. Its flowers are inconspicuous, but its foliage and habit are attractive, and

its autumn coloring is often superb. It is more fully described among the ornamental species.

Rubus xanthocarpus was introduced by the United States Department of Agriculture as a fruit-bearing plant but seems not to have proved valuable.

ORNAMENTAL SPECIES

We are accustomed to think of the members of this family only as fruit-producing plants, yet many of them possess considerable attractiveness as ornamentals, and are worthy of a place in any grounds. Some of them are beautiful in themselves, especially if grown in free and natural clumps, but more especially are they valuable for grouping with other trees and shrubs. Many of the most desirable species are natives of America, and possibly because of this are better appreciated in Europe than here. We are wont to pass by beautiful things growing at our doors for something less desirable which comes from a tropical or foreign country.

Rubus odoratus, the purple-flowering raspberry, or thimbleberry, is so common throughout the greater portion of the eastern part of the United States that we scarcely think of it as being ornamental. Yet it is a very pretty and attractive shrub. It is beautiful both in flower and fruit, and doubly desirable because it continues its blossoming and fruiting period over so long a time. The foliage alone is attractive, regardless of the blossoms. This species is frequently mentioned among ornamentals in European journals. (Fig. 16.)

Rubus parviflorus, the Rocky Mountain thimbleberry,

erroneously called salmon-berry, is closely related. It is better known as *R. Nutkanus*, but since the former name has been found to be the older it must now take the preference. This species and its varieties are found in the region of the great lakes and westward to the Pacific

Fig. 16. *Rubus odoratus* (×¼).

coast. Its fruit seems to have been rather more important in the wild state than that of *R. odoratus*, but, in general the species is much the same, except that the flowers are white. Few attempts seem to have been made to cultivate it. If it could be made to succeed well, it would be a desirable plant to group with the eastern species. (Fig. 17.)

The most attractive member of this section of the genus is undoubtedly *Rubus deliciosus*, of the Rocky Mountains.

Fig. 17. *Rubus parviflorus* (×1/3.)

This, like the two species already mentioned, has simple leaves, three to five-lobed, serrate, but more rounded than in those species. The flowers are large, pure white and attractive. So far as reported, it has generally proved successful, though it does not flourish under the hot sun and drying winds in Nebraska. It is worthy of more

general cultivation than it has yet received. It is somewhat difficult to propagate, which will naturally render it more expensive and harder to get than it otherwise would be. There are nurserymen in the West, however, who make a specialty of collecting these mountain plants, and growing them until accustomed to cultivation before offering them for sale, or even propagating them wholly in the nursery. Plants from such sources can readily be obtained, and will generally prove satisfactory. (Fig. 18.)

Rubus cratægifolius is an oriental species of some ornamental value which has been grown somewhat in this country. Its chief merit lies in its foliage. The flowers

Fig. 18. *Rubus deliciosus* (×⅔).

are small and inconspicuous, and the fruit small, though bright red when ripe. The foliage is dense and bright green, coloring well in autumn, and the bush is pleasing in its habit of growth. It possesses considerable value as an ornamental plant, although there is nothing striking about it. It is generally hardy, and will mass well with other plants and shrubs. In Nebraska it proved disappointing in regard to hardiness, being injured by the winters, even when protected. Yet the rich autumn color developed by the foliage on the young shoots thrown up from the root in spring has offset the loss of the older canes. It is especially recommended for holding banks and covering waste places.

Rubus arcticus, though a very pretty little species, can hardly be expected to succeed in cultivation. It is a native of the far north, and only extends southward upon the high mountain ranges. It is the most delicate and one of the prettiest members of the family, and would be very desirable if it could be grown.

Rubus phœnicolasius, the "Japanese wineberry," has been brought more prominently before the public than most other ornamental species (page 136). Its chief attraction lies in the peculiar reddish hairy character of the plant. Except in favorable localities, this is all there is to recommend it, for the canes are killed to the ground every winter, and there are consequently no flowers or fruit. The oddity of the fruit is one of its attractive features, whenever any is produced. This is enclosed in the long, bristly calyx-lobes until it ripens. It is not well adapted to planting in clumps and masses, like most of the species previously mentioned.

Fig. 19. *Rubus spectabilis* (×¾).

Rubus spectabilis, the salmon-berry, is a showy member of the family, found native from California northward along the Pacific coast. It is a vigorous-growing shrub, with leaves made up of three sharp-pointed, sharply toothed leaflets, or occasionally deeply three-lobed only. The flowers are red or purple, large and showy, and the

fruit large and good, though probably not abundant enough to render it worthy of cultivation on that account. It seems to succeed well in England, and should do equally well in many parts of our own country. It propagates rapidly from suckers, and may sometimes need to be held in check. It is worthy of thorough trial, for it is really a very attractive plant. (Fig. 19.)

Rubus laciniatus, the cut-leaved blackberry, has been brought to notice from time to time as a desirable ornamental, and heralded as a wonderful fruit-bearing plant. Its names have been numerous, including Parsley-leaved, Oregon Evergreen, Oregon Climbing and Sandwich Island. Sometimes it has been styled a dewberry, and sometimes a blackberry. It is interesting from the peculiar subdivision of its leaves, and an occasional plant may prove useful in certain places, but aside from this feature it possesses no ornamental qualities worthy of special note. This is a European species, to which Americans have given more attention than is given to it across the water, though in some localities there it appears to be prized for its fruit production. In this country it produces little or nothing except along the Pacific coast. For a discussion of it in this connection see the chapter on blackberries (page 117). The plant is so desperately thorny, that to attempt to pick its fruit except where carefully trained would be well-nigh hazardous.

The form commonly offered for sale may be described as follows: Stems nearly round, more or less trailing, fertile ones erect, prickles small at the base, but recurved and strong above, very numerous; leaves much dissected and sharply serrate; fruit roundish, black, grains large,

sweet, with a peculiar musky flavor, borne in loose panicles. It differs from other brambles in the fact that the canes are perennial and continue to bear fruit on the old wood. It is best adapted to mild climates.

The Double White and Double Pink brambles are also European species, but they have been long known in this country. The flowers are said to resemble miniature roses more than they do those of the other members of the family. They are reported to be well adapted for use as single specimens, and it is only when thus planted, giving them a chance for full and symmetrical development, that their beauty is to be fully appreciated. These pretty forms have never become so popular and common as they deserve to be; apparently they should be better known.

There are several other species, not so well known as the above, which may in time prove themselves worthy of being planted for ornamental purposes. One of these is *Rubus trifidus*, or fire raspberry, the name applying to the bright red color of the foliage in autumn. This has been tried at the Arnold arboretum and recommended for wider planting.

Another very interesting species, which possibly might succeed here, is *Rubus Henryi*, from China. It belongs to the simple-leaved section of the genus, and is described as "a tall, climbing shrub, with deeply three-lobed, thick leaves, glabrous above and clothed with a white tomentum below; flowers small, red, in terminal racemes." It may be that this would prove more interesting to botanists, owing to its distinct character, than it would to plant-lovers in general.

From the above list it will be seen that the genus, though not considered an ornamental one, is far from being destitute of ornamental qualities. In addition to these more strictly so-called ornamental features, the fruit-producing members of the family possess charms to the true lover of fruits which are not to be despised. A well-grown row of red raspberries, with the scarlet fruit peeping out from among the green foliage, or a row of blackberry bushes covered with clusters of shining black berries, is a sight so attractive that it will be appreciated by many a person on whom the charms of a strictly ornamental plant would fall unheeded. It may, indeed, attract the attention of the most fastidious.

A number of other species, chiefly from China, have been introduced into cultivation for ornamental purposes, and some with the hope of securing fruit of value. Many of them are trailing species suitable for training over arbors and trellises. Some have ornamental foliage and some are evergreen. They have received more attention in England but a number of species have been tested at the Arnold Arboretum in Massachusetts. Most of them have lacked hardiness there. They do not seem therefore to offer any great promise to the American plant-lover.

CHAPTER VII

VARIETIES OF RASPBERRIES

To describe the varieties of bush-fruits in such a manner that the grower can determine them from the description has long since become impossible. Varieties now run into the hundreds and differ so little that other means of determining them must be employed. Yet a brief description or mention of those varieties known to have been grown in America may be of service in several ways. Duplication of names, and consequent confusion are common at best. A complete list, readily available, should prevent this.

No more important question confronts the fruit-grower than the choice of varieties and few lines of progress will contribute more to his success than will careful work in the improvement of varieties. A history of varieties, how and where they have originated, the sources from which they have sprung and the trend of their development is therefore of value in several ways.

The lists are arranged in two groups, one including the black raspberries, the other the red and purple-cane varieties. The latter group has become so complex and the types so intermingled that it seems unwise to attempt longer to keep them separate.

While the present list cannot be complete, it will contain the greater number of the varieties which have been

grown and probably all of those which have become prominent.

BLACK RASPBERRIES

Rubus occidentalis

Black-caps form the youngest group of raspberries in cultivation, but are now the most important. Immense strides have been made since Nicholas Longworth first transferred the Ohio Everbearing to his dooryard in 1832. The species adapts itself so readily to cultivation, and is so uniformly hardy and productive, ripening its fruit in a comparatively short time, and withal is so good to eat, that its popularity is well merited. Its adaptability to being grown as a farm crop, for evaporating purposes, has also given a stimulus to its cultivation. The future of the black raspberry is promising.

Very little need be said concerning the botanical characters of the black-cap, since the species to which it belongs, *Rubus occidentalis*, is so distinct from the other cultivated species of raspberries. The color of the fruit and method of propagation are alone sufficient to distinguish it from others. A western type, *Rubus leucodermis*, is closely related, so closely indeed that it may well be considered as only a geographical variety or modification of the eastern form, though now classed as a species by botanists. It is found in the mountains of California and adjoining states. It is distinguished from *Rubus occidentalis* chiefly by the color of the fruit, which is yellowish red or wine-colored, by the coarser toothed leaflets and the stouter and more hooked prickles.

The Ohio Everbearing appears to have been the first

named variety of black-cap introduced into cultivation. It was found in the state of Ohio, and introduced to public notice by Nicholas Longworth, of Cincinnati, who began its culture in 1832. Next came the American Black, also named Joslyn's Black-cap, Joslyn's Improved, Joslyn's Improved Black-cap, American Improved, etc., but which finally came to be known the country over as Doolittle. This was found growing wild by Leander Joslyn, of Phelps, Ontario County, New York, and introduced by H. H. Doolittle, of Oaks Corners, about 1850. It is said to have owed its especial prominence and value to the method by which it was propagated, only the tips from one-year-old plants being used. This variety did much to spread the cultivation of black-caps throughout the country, and the impetus then gained has steadily increased, until the fruit has become one of the most important. The development of the evaporating industry has done much to increase the extent of its cultivation.

Formerly it was one of the most easily grown and most uniformly successful fruits in cultivation, but in some localities the industry has been seriously threatened by the spread of fungous diseases, notably the anthracnose. We are now learning better how to control this malady so that the industry is not likely to be crippled.

Since the black-cap is the youngest member of the raspberry family, there is reason to hope for much progress in its development. Marked improvement is to be seen in the best varieties of the present day over the wild plants of the woods, or those first introduced. This improvement seems to be going on rapidly, and there is no reason why it should not continue. We want not only better size and

better quality than we now have, but we want equally reliable varieties which will ripen both early and late.

Varieties of Black Raspberries

Ada.—A chance seedling which originated with Henry Young, of Ada, Ohio, about 1882 or 1883. Thought by him to be a cross between Doolittle and Mammoth Cluster. Comparatively free from thorns. Fruit large, jet black, and of good quality. Blooms late. Season with Gregg.

Ak-Sar-Ben.—A seedling discovered by Ex-Gov. Robert W. Furnas, of Brownville, Nebraska. Hardy, large, of good color and fair quality.

Alden.—A name proposed for the Ohio, to better distinguish it from the Ohio Everbearing, but never adopted.—Mich. Exp. Sta., Bull. 111 : 256.

American Black (Common Black-cap, Black Raspberry, Thimbleberry, *Rubus occidentalis*).—This is the common black raspberry of the eastern United States. It was described by Downing as follows: "This raspberry, common in almost every field, with large rambling purple shoots, and flattened, small, black berries, is everywhere known. It is frequently cultivated in gardens, where, if kept well pruned, its berry is much larger and finer. Its rich, acid flavor renders it perhaps the finest sort for kitchen use, tarts, puddings, etc. It ripens a little earlier than most of the European sorts."

American Everbearing.—Named and brought to notice by Mr. Hatfield, of Indiana. Sent out by the Cleveland Nursery Company, of Rio Vista, Va., as an everbearing black-cap.

American White (Yellow Cap, Golden Cap, White Thimbleberry).—Similar in all respects to the black-cap, but with yellowish fruit and canes. It is found wild from time to time, and has often appeared in cultivation, though never very popular.

Arctic.—Described as vigorous, early, not very large, moderately firm, juicy, and sweet.

August Black.—Produced by Thomas Rivers, England. Apparently never cultivated much.

Autumn Black.—Another variety produced by Mr. Rivers.

Babbit.—A chance seedling found near College Springs, Iowa, about 1883.

Babcock Nos. 3, 5 and 9.—Sent out for trial. Geneva (N. Y.) Exp. Station, Bull. 91 : 201.

Barnes.—Mentioned. Ill. Hort. Soc. Rept., 1880 : 78.

Beckner.—Originated in Tippecanoe county, Indiana, about 1855.

Beebe (Beebe's Golden, Beebe's Golden Prolific).—Originated about 1886, with James Beebe, of Cassadaga, N. Y. Said to be productive, but not different from the common yellow-cap.

Belle.—Sent to The Rural New-Yorker by L. C. Carlow, of Batavia, Ill. Very early, large, but lacking in flavor.—Mich. Exp. Sta. Bull. 111 : 260.

Belmont.—Originated by John Scobs, of Barnesville, Ohio, and introduced in 1879.

Black Pearl.—Found among Kansas in 1905 by Herman Krumrei, St. Joseph, Mo. Introduced in 1907. Vigorous, stocky, upright, productive, hardy. Leaves small; fruit early, large, regular, not crumbly, juicy, somewhat seedy, but of good quality. (Plate V.)

Bluffton.—A seedling raised at Bluffton, Mo.—Mo. Hort. Soc. Rept., 1886 : 48.

Bonanza.—Originated with W. C. Freeman, North Springfield, Mo., about 1888.—Mich. Exp. Sta. Bull. 111 : 260.

Bronze Queen.—Origin, Missouri. Fruit sweet, of good quality, with a peculiar bronze color.—Mo. Hort. Soc. Rept., 1886 : 182.

Burns.—A seedling produced by A. M. Burns of Manhattan, Kans. Claimed to withstand drought and heat well.

Carman.—Originated by A. H. Sherwood, Southport, Conn., and named in honor of E. S. Carman, Editor of The Rural New-Yorker. Introduced by G. H. & J. H. Hale. An early variety.

Carpenter Seedling.—A seedling originated by Charles Carpenter, of Kelley's Island, Ohio, closely resembling Beebe's Golden.

Centennial.—Two varieties are mentioned under this name: one found by George Husman, near Hermann, Mo., about 1860, and one found by Mr. Grayhill, near Carthage.—Mo. Hort. Soc. Rept., 1884 : 296.

Champion.—Found in Clark county, Ohio. Sent out by Frank Murphy, of Donnelsville.—Mich. Exp. Sta. Bull. 111 : 263.

Chapman.—Found on the grounds of Mr. Chapman, near Cincinnati, and carried to Ross county, Ohio, about 1864. Thought to be the same as Ohio.

Chesterfield.—Found wild in Chesterfield county, Va.—The Rural New-Yorker, 1884 : 18.

Coloma.—A thornless variety sent out by John Wenslick, Coloma, Mich.

Conrath.—Discovered near Ann Arbor, Mich., in 1886 as a chance seedling near a patch of Gregg, by C. H. Woodruff, who sold the stock to Conrath Bros., for whom it was named. Early, vigorous, productive, large, moderately firm, coal black, ripening early, with a long season.

Corinth.—Mentioned, Mass. Hatch Exp. Station, Bulletin 22.

Cottier Everbearing.—Originating with M. T. Thompson, of Rio Vista, Va. Recommended for its autumn-fruiting qualities.

Crawford.—Mentioned, Mass. Hatch Exp. Station.—Bull. 21 : 11.

Cream.—A yellow-cap mentioned by William Parry in 1870. Mich. Exp. Bull. 111 : 265.

Cromwell (Butler).—Originated by G. S. Butler, of Cromwell, Conn. Introduced by G. H. & J. H. Hale. Resembles Tyler.

Cumberland.—Originated by David Miller, Camp Hill, Penn. Plant stocky, vigorous and productive: fruit large, roundish-conical, firm and of good quality. Late and lasts through a long season. A good variety.

Daily Bearing.—Originated with Mr. Griggs, of Ohio, from seed of the Ohio Everbearing. Canes nearly thornless.

Davis.—A yellow-cap, found on the banks of the New River, North Carolina, some years ago, by an old lady named Davis.

Davison (Davison's Thornless).—Said to have originated in the garden of Mrs. Mercy Davison, of Gowanda, N. Y. Sent out by Joseph Clinton sometime prior to 1866. Probably the earliest variety grown. This, together with the sweetness of its fruit and its freedom from thorns, made it popular in the home-garden.

Diamond (Black Diamond).—A late variety, vigorous and hardy; fruit jet black, very sweet.

Doolittle (Joslyn, Joslyn's Improved, Joslyn's Black-cap, American Improved, etc.).—This was the first variety which really gave prom-

inence to the black raspberry as a commercial fruit. It was introduced by H. H. Doolittle, of Oaks Corners, N. Y. Said to have been found wild by Leander Joslyn, of Phelps, Ontario county, N. Y. Mr. Doolittle seems to have taken great interest in selecting and improving this fruit. The starting point may have been from this plant, found by Mr. Joslyn, or it may have been from wild plants in general. What gave the American black-cap especial value under this name was, perhaps, not so much the variety itself, as the improved method of propagation adopted by Mr. Doolittle, in which only the tips from one-year-old plants were used. Whether his stock was derived from one original plant, or from various selected sources, it is certain that the Doolittle raspberry acquired a fixity of type which made it long the standard cultivated black raspberry.

Doomore.—A seedling found between two rows of Doolittle, by Gustus Swabley, of Tiffin, Ohio, in 1884.

Dorchester.—Mentioned. Guelph, Ont., Exp. Sta., Bull. 27.

Duncan (Kentucky Prolific, Kentucky Mammoth, Kentucky).—Found on the farm of Jack Smith, in Jefferson county, Kentucky, by a man named Duncan. Apparently a popular variety in Kentucky.

Earhart.—A variety of Illinois origin, introduced by Hale Brothers about 1886. Glossy black, rather small, ripening very early. Said to produce a small second crop in September.

Early Cluster.—Mentioned. Rept. Mich. Pom. Soc. 1875: 197.

Early Prolific.—Mentioned as "early, a strong grower, nearly thornless, hardy, productive, and of the best quality."—Missouri Hort. Soc. Rept. 1883: 79.

Ebon Beauty.—Found by F. L. Piers in a piece of woodland in Indiana, in 1887.

Ebony (Farnsworth).—Originated as a chance seedling, about 1885, on the farm of W. W. Farnsworth, of Waterville, Ohio.

Edmunds.—On trial in Michigan. Fruit irregular and crumbly.

Egyptian.—An early variety.

Elsie.—A seedling raised by Samuel Miller, of Bluffton, Mo. Large and excellent. Said to be nearly identical with Surprise.

Emperor.—Mentioned in the Mich. Exp. Sta. Bull. 111, p. 273.

Eureka.—Said to have been discovered wild on the farm of Jacob

Smith, in Miami county, Ohio, by J. C. Kester, of New Carlisle. Brought to notice by W. N. Scarff, of the same place. Said to be equal to Gregg in size. Nearly as early as Palmer. Promising for market.

Everlasting.—Described in The Rural New-Yorker for 1882, p. 669, as an autumn-fruiting variety, from Lawrence Co., Pa.

Every Day.—Commonly thought to be identical with the Ohio Everbearing, but considered by Dr. Warder to be a much more continuous bearer, fruiting almost continuously until frost.

Fadely.—Received at the Pennsylvania Experiment Station from Joshua Fadely, of Sassafras, Va. Claimed to be everbearing. Pa. Exp. Sta. Bull. 32: 11.

Fay (Fay's Thornless).—A variety similar to Davison.

Ferndale.—A chance seedling found by W. B. K. Johnson, Allentown, Pa., along the Delaware River.

Florence.—A yellow variety, originating in New Jersey. Introduced about 1881. Thought at the time to have been one of the best yellow varieties.

Gault.—Found by W. C. Gault, of Ruggles, Ashland county, Ohio, growing by the roadside near his place, in 1887, and introduced by him in 1893. Described as medium to large, dull black, with a slight bloom, moderately juicy, and a good shipper. Season very late. Tends to produce a second crop in autumn.

General Negley.—Mentioned before the Ontario Fruit Growers' Society, as a perpetual bearing black-cap.[1] Under this name Crozier quotes [2] from Dr. J. A. Warder as follows: "A seedling, probably from one of the large foreign varieties, Pilot, Hornet or Franconia, originated by General Negley, of Pittsburg. It is vigorous, of foreign aspect and foliage. Stood the past winter well; is productive, rather early. Fruit large, roundish oblong, juicy, high flavor, and very good."

Gibraltar.—Originated in Ontario; introduced by King Brothers, Dansville, N. Y. Thought to be a cross between Gregg and Hilborn. Claimed to be unusually hardy, vigorous and healthy. Fruit resembles Gregg.

[1] Gar. Month, 12: 278.

[2] Mich. Exp. Sta., Bull. 111: 277.

Golden-cap.—A seedling of the American White-cap, originating in Cedar county, Iowa.

Golden Thornless.—Introduced from Minnesota, by Purdy & Johnston, of Palmyra, N. Y., previous to 1869.

Gray.—Mentioned, Rept. Worcester Hort. Soc., 1881: 24.

Green.—Discovered on the grounds of Green's Nursery Company, of Rochester, N. Y., about 1890.

Gregg (Great Western, Hoosier Mammoth, Western Triumph).—Found growing wild in a ravine on the Gregg farm, in Ohio county, Indiana, in 1866. Largely introduced by N. Ohmer, of Dayton, Ohio, who first saw the fruit on exhibition in 1875. Canes large, upright, very vigorous, possessing an abundance of bloom and a peculiar clean, smooth appearance. More difficult to propagate than many other sorts, owing to its upright, vigorous habit. Fruit large, roundish oblate, with a very decided gray bloom. Flesh very firm, only moderately juicy and sweet. Season late. One of the best known and most popular late varieties. It is uniformly healthy and productive, though slightly lacking in hardiness, especially on heavy soils. The plant is slower to develop than most other varieties, but is also slower to decline, remaining longer in profitable condition. Though not of the highest quality, it is a good berry, and its excellent shipping qualities render it especially adapted to market. It is also an excellent variety for evaporating, especially where fruit is picked by hand. It clings so tightly that it is not easily gathered with the berry harvester.

Hale Early.—Sent out for trial by G. H. & J. H. Hale, of South Glastonbury, Conn., but never introduced.

Hamilton.—Mentioned by Downing as from Shelby Co., Tenn.

Hannibal (Extra Late).—Described as a large, fine berry of excellent quality. Apparently vigorous and productive, being several days later than Gregg. Originated with W. J. Bradt, of North Hannibal, N. Y. Rept. U. S. Dept. of Agr., 1892.

Harrison.—Named in honor of President Harrison by Henry S. Harris, of White Lane, Salem county, N. J., who found it in a neighbor's garden many years ago.

Haskell Yellow.—Taken from Massachusetts to Illinois by Dr. Haskell, about 1836.—Mich. Exp. Sta. Bull. 111: 281.

Hawkeye.—A berry found in Iowa, which is thought to have come originally from Indiana. Said to be better than Doolittle, as firm as Gregg, and as large, but earlier.—Iowa Hort. Soc. Rept. 1884: 535.

Hayne.—Brought to notice by H. Hayne of Delphi, Indiana.

Hilborn.—A seedling found in an old raspberry plantation, and introduced by W. W. Hilborn, of Leamington, Ont., in 1886. Described as sturdy, very hardy, and productive. Fruit nearly as large as Gregg, clear, glossy black, rich and juicy. A favorite variety in many parts of Ohio and Ontario.

Hixon (Hixon's Everbearer).—Appears to have attained some prominence in Kansas. Rept. Kan. Hort. Soc., 1886, p. 290.

Hoag (Harkness).—Originated with Charles R. Hoag, at Kasson, Dodge county, Minnesota. Later it was disseminated by J. W. Harkness. Said to resemble Gregg, but to have been more hardy in Minnesota.

Hoosier.—A midseason variety, hardy and prolific.

Hopkins.—Found wild in the woods, within the present limits of Kansas City, Mo., in the year 1872. Later brought to notice by G. W. Hopkins, of Springfield, Mo., and introduced by Frank Holsinger, of Rosedale, Kans. Similar to Tyler. Considered valuable in the region where it originated.

Idaho.—Mentioned by Crozier,[1] as possibly a variety of *Rubus leucodermis*. Said to have come from the mountains near Lewiston, Idaho. It was sent out for trial by F. R. Palmer, of Mansfield, Ohio, but did not prove valuable.

Ideal.—A seedling found near a Gregg plantation, in 1890, by C. P. Augur, of Connecticut, who described it as nearly as good as the Souhegan, and larger and better in every way than the Gregg.—The Rural New-Yorker, 1893: 430.

Indiana.—A black-cap from Indiana, introduced in 1884.

Ironclad (Smith's Ironclad).—A variety of this name seems to have originated at Forest, Ohio, about 1885. Under the name "Smith's Ironclad," Crozier records a variety,[2] brought to notice in Kansas by a man named Smith, some years ago, he having found a

[1] Mich. Exp. Sta., Bull. 111: 284.

[2] Mich. Exp. Sta., Bull. 111: 309.

single raspberry plant among a bill of trees ordered from an agent. Probably an old variety, but known in Kansas under the names mentioned.

Kagy Everbearing.—Mentioned. Ohio Expt. Sta. Rept., 1886, p. 190.

Kansas.—Originated as a chance seedling on the farm of A. H. Griesa, Lawrence, Kans., in 1884. Although he had growing, at the same time, several hundred other seedlings from selected stock, this proved more valuable than any of the others. Vigorous, hardy, exceedingly thorny, rooting very readily at the tips. Fruit large, ripening a week earlier than Gregg, with less bloom, juicy, fairly firm, and of excellent flavor. A prominent commercial variety.

Kellogg.—A chance seedling found by George J. Kellogg, of Wisconsin, about 1875. Similar to Doolittle.

Kerr White.—Large, of moderate vigor and productiveness, with light yellow, pubescent fruit.

Key Prolific (Johnston's Sweet).—A black-cap found in the Ozark Mountains, Ark. Grown in Iowa since about 1881. Fruit small, very sweet, and excellent for drying. Reintroduced by Robert Johnston, of Shortsville, N. Y., in 1886, as Johnston's Sweet.—Ia. Hort. Soc. 1887: 98.

Kimball.—Found growing wild on the farm of James Kimball, near Providence, Rhode Island, in 1885. Never introduced.—Mich. Exp. Sta. Bull. 111: 287.

King of Cliffs.—Introduced by Bradley Brothers of Illinois as an everbearing black-cap. Found in 1905 around a cliff of rocks near a field of Cumberland and Conrath and thought to be a cross between them. Said to begin ripening with Gandy strawberries and to continue to bear fruit until November. Plant hardy, resembling Cumberland; fruit firm, jet black, of good flavor.

Lawrence.—Originated by A. H. Griesa, Lawrence, Kans. Plants vigorous, usually hardy, productive. Fruit large, fairly firm, attractive black, fair to good. Has many points to commend it for trial as a commercial berry; lacks slightly in quality.

Lindsey.—A variety said to have originated in Michigan.—Ia. Hort. Soc. Rept., 1882: 478.

Little (Little's Black-Cap). Originated with John Little, of On-

tario. Sent to T. T. Lyon, of Michigan, in 1881. Much like Davison's Thornless.—Mich. Hort. Soc. Rept., 1882: 169.

Livingston.—Vigorous, productive, of medium size and fair quality.

Lotta (Brackett's No. 101). Originated on the farm of G. C. Brackett, of Lawrence, Kans. A hardy and productive variety. Fruit large, round, black, with slight bloom; quality good; as large as Gregg and somewhat earlier. A valuable variety, but susceptible to rust and anthracnose.

Lovett.—Found among a lot of wild seedlings on the grounds of Ezra Wood, of Ohio. Introduced by J. T. Lovett Co., of New Jersey. Said to be vigorous, productive, and to ripen early. Fruit firm, black, resembling Tyler; apparently thornless.

Lum Everbearing (Autumn Black Raspberry, Lum's Fall Bearing).—Raised by H. B. Lum, of Sandusky, Ohio. Much like the Ohio Everbearing, of which it is a seedling.

Lum Yellow Canada.—An everbearing variety. Mich. Exp. Sta. Bull. 111: 289.

Macomber.—This name, with numbers or letters appended, has been applied to various seedlings sent out on trial by J. T. Macomber and L. M. Macomber, of Vermont, though apparently not retained as a permanent name of any variety.—Mich. Exp. Sta. Bull. 111: 289.

Manwaring No. 1.—Sent out by C. H. Manwaring, of Kansas.

May King.—Similar to Souhegan.

McCracken.—Originated by William McCracken, of Sunnydale, Kans., and distributed under the name Kansas, though not the same as the better-known variety of that name.

McCormick (Mammoth Cluster, Miami Black-cap, Collinsville Miami, etc.).—For many years the leading black-cap in cultivation. It appears to have originated in Indiana, from the Old or Small Miami. A thoroughly hardy and very productive variety; a vigorous grower, bearing fruit of medium size, but of a slightly reddish black color. Quality good; season medium.

Miami (Miami Black, Old Miami, Small Miami).—A common black-cap, originally found growing along the Miami River, in Ohio. A vigorous, productive variety, of less value than the McCormick,

more brownish red, not quite as sweet nor quite as late in ripening.—Downing.

Midwest.—Originated by G. W. Alexander, Peru, Nebr. A cross between Cumberland and Cardinal. Introduced by J. R. Duncan & Co., Peru, Nebr. Bushes vigorous, productive, usually hardy. Fruit matures about with Cumberland; berries large, attractive black, roundish-conic, very firm, sweet, good.

Miller Daily (Miller's Daily Bearing).—Apparently a local variety near Dunreith, Ind. A large, everbearing black-cap.

Mills (Mills No. 15).—Introduced by Charles Mills, of Fairmount, N. Y. Raised from seed of the Gregg said to have been fertilized by Tyler. A strong, healthy, upright grower, moderately productive. Fruit of medium size and excellent flavor.

Mills No. 1.—Of the same parentage as the preceding. Described as vigorous, fairly hardy. Fruit large, firm, seedy, moderately juicy, good quality.

Minnesota (Minnesotian).—A western yellow-cap, mentioned in various places.

Mohler.—Originated by D. H. Mohler, New Paris, Ohio, from seed of the Eureka. Canes large, vigorous, very productive. Fruit very large, firm, good, black, early. The name "Mohler" seems to have been applied to the Eureka at one time, before the introduction of this variety. Ohio Exp. Sta. Bull. 63.

Moody.—A white variety mentioned by Samuel Miller, in the Missouri Horticultural Society Report for 1884, p. 295.

Moore Seedling.—Mentioned. Ohio Hort. Soc. Rept. 1870, p. 62.

Munger.—Originated with Timothy Munger in western Ohio, about 1890. Introduced by W. N. Scarff. Described as a good shipper, black, of good flavor, large size and very productive.

Munson's Everbearing.—Reported the most reliable variety in Nebraska, but poor and small.

Mystery.—Sent out from Kentucky as an everbearing sort. Reported as of little value, bearing no autumn crop in Minnesota.—Bull. 25.

Nemaha.—Found growing wild by Ex-Gov. Furnas, of Brownville, Nebr., along the bluffs of the Missouri River in Nemaha county, of that state. Introduced by Green's Nursery Company, about

1883. Very similar to the Gregg, but hardier. Vigorous and productive. Fruit large, of good quality, and firm. Popular in southeastern Nebraska.

New Haven.—A chance seedling which came up on the grounds of E. E. Clark, of New Haven, Conn., proving better than any seedlings he had raised. Rept. Conn. Board of Agr. 1866: 184.

Norfolk.—Mentioned as unsatisfactory.—Mich. Exp. Sta. Bull. 122.

Northfield.—Sent out for trial by M. T. Thompson, of Rio Vista, Va., but never introduced.—Mich. Exp. Sta. Bull. 111: 294.

Ohio (Alden).—The great evaporating raspberry, having been more largely planted for that purpose than all others together. The full history of this variety is recorded by Bailey in Bulletin 117, Cornell University Exp. Station, p. 362. Somewhere in the sixties, Hiram Van Dusen, of Palmyra, N. Y., bought a lot of Doolittle plants of A. M. Purdy, of that place. When the plantation began to fail, he found one plant apparently as good as new, which, from previous observation, he knew to be firmer, more productive, and to ripen later. The Doolittle plants mentioned, it was found, came from Ohio, and Mr. Van Dusen called this the "Ohio" to distinguish it from the Doolittle. It was introduced by a son and grandson of Mr. Van Dusen. A. M. Purdy was of the opinion that this was precisely identical with what he grew at that time as the Miami, obtained from Ohio, and states that it was so decided by John J. Thomas and Patrick Barry, who saw them growing on his grounds. This, like many market fruits, though hardy and productive, is not of good quality. It is one of the most seedy varieties grown, and it is partially for this reason, no doubt, that it yields more pounds of evaporated fruit per bushel than other sorts.

Ohio Everbearing (Monthly Black-cap).—A full account of the history of this variety is also given by Bailey in Bulletin 117 of the Cornell University Experiment Station. (See also page 148.) The taking up of this variety by Nicholas Longworth appears to have been the beginning of the cultivation of the black raspberry in America. It is of especial interest on this account, although not a variety of great value. Its chief feature seems to have been its autumn bearing habit.

Older.—Found in the garden of Mr. Older, of Independence, Ia., in 1872. It was named in honor of Mr. Older, after his death, by Mr. Burser, of Warren, Ill., and introduced by L. K. Ballard, of the same place. Hardy, strong, vigorous, enduring drought well. Fruit large, nearly destitute of bloom, black and firm, of good quality. Popular in the West.

Onondaga (Mills No. 7).—A seedling raised in 1884 by Charles Mills, of Fairmount, N. Y., from seed of the Gregg growing near Tyler. Vigorous, productive, very large, firm, jet black, ripening with Gregg or a little earlier.

Ontario.—Found on the grounds of E. E. Lord, of Fairport, N. Y., in 1886, and introduced by him in 1872. Fruit large, firm, sweet and rich, earlier than Doolittle.

Oregon.—Said to be a native variety of especial value in the state for which it is named. Not as dry as other black-caps, and larger than Gregg. Referred to *Rubus leucodermis.*—Mich. Exp. Sta. Bull. 111: 297.

Ozark.—A seedling brought to notice by Mr. Holman, of Missouri. Somewhat like Gregg,—Mo. Hort. Soc. Rept. 1886: 182.

Palmer (Palmer's No. 1, Acme).—Originated by F. R. Palmer, of Mansfield, Ohio. Introduced in the fall of 1888. Similar to Tyler, and ripening with it. Hardy, early, large, of good quality and productive. It has been largely grown, especially in the West.

Pioneer (Progress).—Originated on the farm of Jacob Muhl, of Hammonton, N. J. Apparently grown by him for some time before being introduced by the J. T. Lovett Co., who offered it under the name "Progress." Much like Souhegan, but claimed to be later, more vigorous and productive.

Plum Farmer.—Found by L. J. Farmer, Pulaski, N. Y., in a shipment of another variety from Ohio. Introduced in 1895. Vigorous, upright, dense, hardy, very productive and healthy. Fruit early, ripening a week or more before Gregg, easily picked, a good shipper and one of the best to withstand drought. Berries large, very black but not glossy, firm, uniform, juicy and of good quality. One of the most satisfactory present-day varieties. (Plate II.)

Poscharsky.—Different numbers under this name have been sent

out by Poscharsky & Son of Princeton, Ill. No. 7, strong, productive, with fruit resembling Gregg, but of better quality, is promising.

Pride of Ohio.—Hardy, vigorous, solid black, firm.

Pride of the Market.—The name appeared in L. L. May & Co's catalogue.

Pride of the West.—Said to be fairly productive and vigorous, large, grayish black, of fair quality, ripening with Gregg.

Queen of the West.—A Kansas seedling, ripening a few days earlier than Souhegan, but larger and more productive.—Mich. Exp. Sta. Bull. 111: 302.

Rachel.—A chance seedling found in 1891 by Rachel D. Mitchell, Geneva, N. Y.; not introduced. Plants usually hardy, very vigorous, productive, almost immune to anthracnose. Foliage very healthy, dark green. Fruit matures very late; berries large, attractive, black when fully ripe, very firm, with abundant bloom, mild, sweet, good in quality.

Ransom Everbearing.—Sent out by Stark Bros., of Louisiana, Mo., in 1890.—Mich. Exp. Sta. Bull. 111: 303.

Rex.—A seedling of the Gregg raised by John W. Perry of Covington, Ohio, in 1884 or 1885.—Mich. Exp. Sta. Bull. 111: 305.

Reyes.—"The sweetest black-cap I have ever tasted."—P. C. Reynolds, Mich. Hort. Soc. Rept., 1886: 63.

Rocky Mountain Cluster.—Mentioned. Mo. Hort. Soc. Rept. 1897, p. 27.

Rundell.—A yellow-cap closely resembling Beebe's Golden. Found by Charles Rundell, of New Buffalo, Mich.—Mich. Exp. Sta. Bull. 11: 306.

Saunders No. 60.—A seedling of Gregg, produced by Professor William Saunders, of London, Ont. Mich. Exp. Sta. Bull. 111: 307.

Savanna.—A variety obtained from the woods in Oklahoma, near Savanna, and so named by T. V. Munson, of Denison, Texas. Earlier than Tyler, prolific, very sweet, enduring extremes of climate well.—Mich. Exp. Sta. Bull. 111 : 307.

Scarff.—Introduced by W. N. Scarff, New Carlisle, Ohio. Supposed to be a seedling of Gregg. Hardy, very productive, vigorous, healthy, upright. Fruit about the size of Cumberland.

Seneca.—Raised by Mr. Dell, of Seneca county, N. Y., and

brought to notice by Doolittle & Wright, of Waterloo, N. Y., in 1867. A large late variety, very vigorous and productive. Fruit large, somewhat reddish, with a light bloom.

Sinton Thornless.—Recorded by Fuller, in 1867, as similar to Doolittle, but a week earlier.—Mich. Exp. Sta. Bull. 111 : 309.

Smith Giant.—Apparently a seedling of the Gregg, produced by A. M. Smith, of St. Catharines, Ont., who reported it hardier than that variety.

Smith No. 1.—A chance seedling sent to the Geneva, N. Y., Experiment Station which gave a high percentage of promising seedlings in breeding work.

Smith No. 2.—Sent to the Geneva (N. Y.) Experiment Station, by B. F. Smith, of Lawrence, Kans., who found it growing under an apple tree.

Smith Prolific.—A chance seedling found in a strawberry patch on the grounds of N. G. Smith, of Manchester, N. Y.

Souhegan (Skowhegan).—Originated in the valley of the Souhegan River, New Hampshire, about 1870, from seed of the Doolittle, by J. A. Carlton. Introduced by G. H. & J. H. Hale in 1881. One of the standard early varieties, widely known and generally prized. Canes hardy, vigorous, and productive. Berries medium to large, jet black, without bloom, of good quality.

Spanish Black.—Grown and sold by Henry Geisler, of Watervliet, Mich. It is reported to be the Gregg re-named.—Mich. Exp. Sta. Bull. 111 : 311.

Spray Early.—A chance seedling brought into cultivation at Fort Atkinson, Wis., about 1884.

Springfield.—A chance seedling, found about 1880 on the grounds of J. W. Adams, of Springfield, Mass. Described as thornless, very early, prolific, of good quality and perfectly hardy. Somewhat resembles Davison.

Stahelin.—From F. J. Stahelin, Bridgeman, Mich. Unpromising at the Mich. Exp. Station.

Stone Fort.—Received at the New York Agricultural Experiment Station, Geneva, N. Y., in 1909, from J. T. Lovett, Little Silver, New Jersey. Bushes vigorous when not attacked by anthracnose to which it is susceptible, usually productive, not always hardy;

fruit matures in mid-season; berries variable in size, firm, heavily pubescent, good black, not as sweet or as high in quality as Kansas or Plum Farmer.

Success (Waters' Success).—Sent out for trial in 1893, by James N. Waters, Fernhill, Ont. Very promising on the grounds of The Rural New-Yorker.—Mich. Exp. Sta. Bull. 111 : 318.

Summit.—A yellow variety from Summit township, Crawford county, Pa. It was thought to have originated from seed found in soil excavated at a depth of ten feet. The original plant was found and transplanted by Daniel Supher, but was brought to notice by A. T. Hobbs, of Randolph, Pa.

Surprise.—Found wild, and introduced to notice by Charles Husmann, of Bluffton, Mo., about 1865. Large, more conical and darker than the common black-cap.—Downing.

Surrey.—Introduced by the Cleveland Nursery Co. of Rio Vista, Va.—Mich. Exp. Sta. Bull. 111 : 313.

Sweet Home.—A seedling of Lum's Everbearing, from Illinois. Introduced about 1880. Similar to McCormick.

Thomas (Thomas' Seedling).—Originated by Mr. Thomas, of Marion, Ind.

Thompson Sweet.—Mentioned in Bulletins of the Mass. Hatch Experiment Station.

Townsend No. 2.—Mentioned as on test at the Geneva (N. Y.) Experiment Station.

Tyler.—An accidental seedling, found growing among McCormick and Seneca plants on the grounds of Nathan Tyler, of Auburn, N. Y. Five hundred plants were sold to Robert Johnston, of Shortsville, N. Y., who introduced it under the name Tyler. An excellent early variety, of good size and quality, jet black, hardy and productive. It resembles Souhegan very closely, although of entirely different origin. It has been thought to withstand spring frosts better than Souhegan. After the Doolittle passed the zenith of its popularity, these two varieties long stood as the representative berries.

Virginia.—A variety introduced by the Cleveland Nursery Co., of Rio Vista, Va. Said to be large, jet black, round, conical, moderately firm, of excellent quality, holding out well at the end of the season.—Mich. Exp. Sta. Bull. 111 : 317.

Wade.—Found by John Wade, of Veedersburg, Ind., in the Spring of 1884, under a grape trellis where birds had dropped the seed. Described by him as an ironclad variety, wonderfully productive. Fruit showy black, firm, of superior quality, ripening about with Souhegan.

Westchester.—A chance seedling, found in 1861 in the garden of Levi J. Mabie, of Tarrytown, Westchester county, N. Y.—Mich. Exp. Sta. Bull. 111 : 318.

Winfield.—A midseason variety.

Winona.—An Ohio variety, introduced in 1890.

Wonder.—An everbearing variety, originating with J. H. Robbins, of Arcadia, Ind.—Mich. Exp. Sta. Bull. 111 : 319.

Woodside.—Originated in New York, from seed sown in a garden. Produces a second crop in autumn.—Fuller.

Wragg.—An Ohio variety on trial in Michigan.

Yellow Pearl.—A yellow-cap variety often producing a fall crop.—Downing.

Yosemite.—A rampant grower, and very thorny; berries large and of poor quality.—Cal. Hort. Rept. 1885: 233. Perhaps of *Rubus leucodermis* parentage.

Recommended varieties of black-caps.—Kansas and Plum Farmer (Plate II) are perhaps the two most popular black-caps at the present day, having largely replaced such varieties as Tyler and Palmer. Gregg is still the standard late berry, though the Nemaha is preferred in places, while Ohio is the great berry for evaporating purposes. Other varieties well and favorably known are Cumberland, Lotta and Older.

THE RED AND HYBRID RASPBERRIES

Two species are included in the true red raspberries of cultivation,—the European red raspberry, *Rubus Idæus*, Fig. 20, and the American red, *Rubus strigosus*, Fig. 21.

Fig. 20. *Rubus Idæus* (×½).

Though similar in general appearance and in their botanical characters, there are essential points of difference. Botanically, it may be said, that the European plant is rather stouter and less free in its habit of growth, the leaves are a little whiter beneath, thicker, and generally

somewhat wrinkled, and the canes are light colored, bearing purple prickles in some varieties. The prickles on the finer parts are firmer, recurved and less numerous.

The horticultural differences are more marked than

Fig. 21. *Rubus strigosus* (×1/3).

the botanical differences, the chief one being the habit of the European raspberry to continue bearing more or less throughout the greater part of the season after ripening begins. This feature, while it may be desirable in a home berry, is objectionable in a market berry. Another im-

portant point of difference between the two species is in hardiness. Few, if any of the European varieties can be depended upon to endure our winters without protection, except in the most favorable localities, and even then they are unreliable. It is also probable that our hot, dry summers are an unfavorable factor as well as the cold of winter. No better evidence of their lack of adaptability to our climate is needed than the fact that while there have been something like one hundred varieties belonging to this species introduced in the United States, probably not over five or six are grown at all at the present time, and these only in a very small way. The fruit is generally conceded to be of better quality than our American reds, and if the plants had proved satisfactory, this species would naturally have been in the ascendency.

The native red raspberry of the United States has been much longer in cultivation than the black raspberry or the blackberry, but is much younger than the European berry. In spite of its youthfulness, it has long since outrun its European cousin and gained control of the commercial red raspberry-growing of the country. While it may be slightly behind the European berry in quality of fruit, it is so thoroughly at home, and adapts itself so readily to cultivation, that it has become a far more desirable market berry. One great objection to the red raspberry as a market fruit is its long bearing season, necessitating so many pickings to secure the crop. The American sorts have the advantage in this regard, although even they ripen too unevenly.

The number of varieties of the hybrid, *Rubus neglectus*, type, or Purple-cane family, as it was formerly called, is

a point of interest in the history of the raspberry. Some forty varieties can be definitely placed in this class. Among those too little known to permit of classification some doubtless also belong here. The group includes all variations between the red and the black raspberry. Nearly all propagate by tips, like the black-caps, but a few propagate by suckers, though sparingly. This is true of the Philadelphia and its numerous seedlings, which are much more like *Rubus strigosus* than *Rubus occidentalis*, being practically red raspberries of a slightly darker hue.

Whether plants of this intermediate character should be considered hybrids or recognized as a distinct species was long an unsolved problem. So much experimental work in breeding raspberries has now been carried on, and so many artificial hybrids produced, and their behavior and characters are so well known that there seems no longer any reason to question the belief that all these forms are primarily of hybrid origin.

Hybrids often lack vigor and are unproductive. This is true of some Rubus hybrids, but the red and black raspberry are so nearly akin that hybrids between them do not necessarily follow this rule. Shaffer and Columbian are among the most productive varieties in cultivation.

The history of the red raspberry as found in the old herbals and other ancient writings, as well as its development in our own country, is interesting. The following account, with quotations from some of the older writers, was at one time contributed to "The American Garden" by the writer.

History and Future of the Red Raspberries

The history of the European raspberry, *Rubus Idœus*, runs far back into the ages. It is mentioned by Cato, who lived before the beginning of the Christian era, and it appears to have been a natural product of Roman territory. Pliny the Elder, supposed to have written about A. D. 45, mentions it as one of the wild brambles which the Greeks called "Idea," having derived its name from Mount Ida, in Asia Minor, at the foot of which lay the renowned city of Troy. In this mountain were said to dwell fabulous beings, who were credited with being the first to work iron and copper, and with having introduced music and rhythm into Greece. Perhaps we may infer that in the exercise of the marvelous powers which they were alleged to possess, they produced this glorious fruit to appease some angry god, or gladden the eye and delight the taste of a gracious princess. Although deriving its name from this locality, where it was particularly abundant, the raspberry is indigenous over the greater part of Europe and northern Asia. It is impossible to tell whether the plants were cultivated at this early date, and it is not unlikely that the gods, like many mortals of the present day, were obliged to be content with the precarious supply to be found growing at will in grove and glade. Palladeus, however, a Roman writer of the fourth century, mentions the raspberry as one of the cultivated fruits of that time. From a work written by Conrad Heresbach, entitled "Rei Rusticæ," published in 1570, and afterward translated by Barnaby Googe, it appears that raspberries were little attended to during that period. John Parkinson, in his "Paradisus," published in 1629, speaks of red, white and thornless raspberries as suitable for the English climate. Stephen Switzer, in 1724, only mentions three kinds. George W. Johnson, in his "History of English Gardening," published in 1829, gives the number of cultivated varieties as twenty-three. From these detached notes it appears that although cultivated at least as far back as the fourth century, it nevertheless did not come to be considered a fruit of any importance and demand attention until the close of the sixteenth century, or later.

The raspberry never seems to have been held in such high esteem

The Deſcription.

THE Frambope is a kinde of Bramble, whoſe leaues and branches are not muche vnlyke the other Bramble, but not ſo rough and prickley, nor ſet with ſo many ſharpe prickles, and ſomtimes without prickles, eſpecially the newe ſhutes and tender ſpringes that be not aboue the age of a yeere. The fruite or berrie is redde, but otherwiſe it is lyke to the other. The roote is long creping in the ground, and putteth foorth euery yere new ſhutes or ſpringes, the which the next yeere doo bring foorth their flowers and fruite,

The Place.

The Frambope is founde in ſome places of Douchland in darke woods: and in this Countrie they plante it in gardens, and it loueth ſhadowye places, where as the Sonne ſhineth not often.

The Tyme.

The Frambope flowreth in May and June, the fruite is ripe in July.

Fig. 22. Description of the raspberry by Dodoens, 1578.

for its medicinal properties as the blackberry. Gerard Dewes, in his translation of "Dodoen's Niewe Herball," or "Historie of Plantes," published in 1587, enumerates the following "vertues:"

"The leaves, tender springes, fruit and roote of this Bramble are not much unlyke, in vertue and working, to the leaves, shutes, fruite and rootes of the other Bramble, as Dioscorides writeth.

"The flowers of Raspis are good to be bruysed with hony, and layde to the inflammations and hoate humours gathered togither in the eyes, and Erysipelas or wilde fire, for it quencheth such hoate burninges.

"They be also good to be dronken with water of them that have weake stomackes."

The illustration (Fig. 22) shows a specimen of the text of this work, giving the description, habitat and time of flowering of the Framboye, Raspis or Hyndberie, as the raspberry was then called in French, English and German, respectively. The figure of the plant (Fig. 23) is reproduced from John Gerarde's "Historie of Plantes," published in 1597.

After the settlement of this country the first attempts at cultivation, as with other fruits, were with varieties which had been familiar in England. In the second edition of William R. Prince's "Pomological Manual," published in 1832, fourteen varieties are described and six others mentioned as meriting culture. All but four of these are probably varieties of *R. Idæus*, although in some cases it is impossible to decide with certainty. Of these four, at least three appear to be forms of *R. strigosus* from different localities, while the fourth may belong to the *Rubus neglectus*, or Purple-cane type. One of the varieties which appears to be European may also belong here. The American Pomological Society, at its second session in 1853, recommended four varieties for general cultivation, and commended one more as promising, all of which were foreign sorts. In the catalogue, as recommended by the last session in 1891, there appear fourteen varieties of *Rubus Idæus*, one of which is placed there doubtfully, and six of which are seedlings of American origin. There are also twenty-nine native varieties, six of which are classed under *R. neglectus*, fourteen under *R. occidentalis*, and nine under *R. strigosus*. This, however, is far from representing the true

Fig. 23. Gerarde's picture of the raspberry, 1597.

state of comparative cultivation of the foreign and native species and varieties at the present time, for of the fourteen foreign varieties and their seedlings still retained, not over five or six are now cultivated to any extent, and these only in very limited areas.

While the *Rubus Idæus* type is everywhere acknowledged to be superior in the quality of its fruit, it is not able to maintain itself against summer suns and winter winds, and has had to give place to hardier sorts, better able to fight their own battles and emerge from them bearing abundant trophies of fruit, not so exquisite, perhaps, yet more substantial and sure. Moreover, with the gradual improvement which has gone on, there is at present little need for foreign varieties. The best of our natives yield fruit which is doubtless far superior to that which gratified the gods on Mount Ida in those days of war and wonder. Among the first varieties of *R. strigosus* to become prominent were the Stoever and Brandywine. The former is a form of the American red, found wild near Lake Dunmore, in Vermont, by Jefferson F. Stoever, and removed to his garden at Tacony, near Philadelphia, where it first fruited in 1859. The Brandywine, or Susqueco, as it was at one time called (Susqueco being the Indian name for Brandywine), is of unknown origin. It first attracted attention in the Wilmington market, and was for a time called Wilmington.

We are accustomed to boast of the marvelous progress in all lines of American development. What advance can we show in the improvement of the raspberry? Some, to be sure, but most of it has been mere accident. In looking up the history of varieties it is the same story over and over again—"a chance seedling found growing wild," etc. Nearly all of our prominent varieties have originated in this way. A few men have gone to work systematically to breed and develop varieties. The first and most prominent of these was Dr. William D. Brinckle, of Philadelphia—a busy physician, who, having a taste for pomology, pursued it as a means of recreation from other duties. He experimented with strawberries and pears, as well as with raspberries. So important was his work in these lines that he seems to be much better remembered for that than for his medical reputation, although he was successful and prominent in this field also. He was president of the American Pomological So-

ciety at its second session, and for many years vice-president of the Pennsylvania Horticultural Society, repeatedly refusing its presidency. Unfortunately his work on raspberries was with the *Rubus Idæus* species, and most of the varieties which he produced have suffered the fate of the class to which they belonged; yet he obtained in Brincklé's Orange the variety which has stood as the desideratum to be sought in quality to the present day. Another who achieved good results in this line was David W. Herstine, of Branchtown, near Philadelphia, the originator of the Herstine, Saunders, Ruby and Elizabeth raspberries; yet these were simply seedlings of the Allen, grown in alternate rows with the Philadelphia. William Saunders, of Ontario, has also produced a number of varieties, some of which are said to be hybrids.

Good as the varieties are which we have, we want further improvements. Nothing is good enough to satisfy human demands. We want back all we have lost in giving up the raspberry of our forefathers beyond the sea; but coupled with that, we want all we have gained from the hardier species of our own country. We want a red raspberry as good as Brincklé's Orange in quality, as large and productive as Cuthbert and of brighter color, as hardy as the Turner, and we want it on a black-cap bush without the thorns. Will we get it? The Shaffer is our nearest approach at present. What the possibilities of careful, systematic and progressive breeding are, only the future can show.

No marked change in the status of the red and hybrid raspberry in America is apparent since the above words were written, some twenty-five years ago. Cuthbert is still the leading red variety, with Marlboro prominent in some localities. In the hybrid class Columbian is supplanting Shaffer. New varieties have appeared, to be sure, and some of them may become prominent, especially in certain regions. Much systematic work in crossing and hybridizing has been done and many seedlings have been grown. Among those prominent in this work have

been members of the horticultural staff at the Geneva, New York, Experiment Station, Saunders and others in Ontario, Hansen in South Dakota and the writer in Rhode Island. From all this work a few, but very few, varieties have been introduced. Many had good qualities, but few were of sufficient merit to replace those already in cultivation. Pomological progress among the brambles has not been rapid.

In the following list of varieties those known to belong to the hybrid or Purple-cane class are followed by the letter (H) to indicate their origin. Similarly, those known to be of foreign parentage or *Rubus Idæus*, are designated by the letter (F). Many of those about which little is known also doubtless belong here.

Varieties of Red and Hybrid Raspberries

Addison (H).—Originated on the grounds of L. M. Macomber, of North Ferrisburgh, Vt. Canes rooting at the tips, though rather like the reds in color. Fruit with the flavor of the red raspberry.

Allen.—See False Red Antwerp.

Allen Red Prolific.—Same origin as the Allen. Perhaps also included under the False Red Antwerp.

All Summer (F).—Introduced by John Lewis Childs, of Floral Park, N. Y., as having been purchased from Mrs. A. A. Stowe. Said to have come from Mexico, by way of California. Recommended for its ability to endure extreme heat.

Alpine (F).—Imported from the Mediterranean with Cretan Red and Flesh-colored by William R. Prince, who believed them to be closely related.

Alton.—Introduced by The Gilbertson Nursery Company of Iowa. Said to be hardy, productive, of high quality, with a long fruiting season.

Amazon (F).—Sent out from Edesville, Md., as a new variety, but thought by those who received it to be the Fontenay.

American Red (Common Red, English Red).—Prince states in the Pomological Manual published in 1832, that although this is a native of New York, growing naturally in the Catskill mountains, it is frequently termed English Red. He says the shoots are of a dark red hue and grow very long. The spines on the present year's shoots are purplish in color near the base, but greenish, with brown or purplish barbs or points on the upper part. The fruit is one of the earliest to mature, of medium size, fine flavor and greatly esteemed. He comments on the fact that this is the only variety grown to any extent for the New York market, and that there were nearly one hundred acres on Long Island devoted to its culture at that time. Evidently this is a forerunner of American Red raspberry culture, but undoubtedly plants from various sources passed under this name.

Andrews.—Thought by J. T. Lovett to be identical with Highland Hardy, while James Smith, of Iowa, is positive that this and the Highland Hardy are only the Kirtland renamed.

Arnold Orange (Orange King) (F).—Originated with Charles Arnold, Paris, Ont. Fruit large, dark orange color, unsurpassed for flavor. Said to be a yellow-cap crossed with *Rubus Idœus.*

Arnold Red (F).—Origin same as the previous; the best known of Mr. Arnold's seedlings. Said to bear a good crop both in July and in September. Also said to be a cross between the yellow-cap, *Rubus occidentalis,* and *Rubus Idœus.*

Arnold Yellow (Yellow Canada) (F).—Of the same origin and parentage as the two preceding. Fruit nearly white; plant of a peculiar albino appearance.

Babcock (H).—Sent to the Geneva (N. Y.) Experiment Station in 1892, by Daniel W. Babcock. Canes purplish, thickly beset with weak prickles.

Bagley Perpetual (Bagley's Everbearing).—Originated about 1854, at New Haven, Conn. Introduced in 1858 by A. Bridgeman, a florist of New York.

Baker (F).—A seedling of Merveille des Quatre Saisons. Raised by Mr. Parnell, of Cincinnati.

Barnet (Cornwall's Prolific, Cornwall's Seedling, Lord Exmouth, Large Red, Barnet Antwerp, Barnet Cane) (F).—An old English variety, said by Prince to resemble Red Antwerp, but distinguished by its branching canes and long, slender, reddish prickles.

Barter.—First grown by William Barter, of Penryn, Placer county, Cal., to whom it was given as a "foundling." Grown in the foot-hill regions of that state.

Baumforth (Baumforth's Seedling) (F).—Originated in England from seed of the Northumberland Fillbasket.

Beckwith (H).—An unnamed chance seedling, which originated with Professor M. H. Beckwith, Newark, Del. Described by him as a red berry, not purple, reproducing by tips. Fruit resembling the black-caps in shape, aromatic, of excellent quality.

Beehive.—Introduced by Messrs. Winter & Co., of the Linnæan Botanic Garden, Flushing, N. Y.

Berkeley (Dwinelle, Kelsey, New French).—Prolific, large and handsome.—Ashley Nursery Catalogue, California.

Biggar Seedling (F).—Raised by C. A. Biggar, of Drummondville, Ont., from an unknown European variety. Largely used as a parent variety by Professor William Saunders, of London, Ont., in producing his hybrid varieties.

Black (English Black) (F).—Mentioned by Downing as a hybrid from England.

Black Hills.—Mentioned. Proc. N. J. Hort. Soc. 1900: 195.

Brandywine (Susqueco, Wilmington).—Said to have been found near Brandywine Creek at Wilmington, Del. It first attracted attention in the Wilmington market, and was for a time called the Wilmington. Mr. Edward Tatnell, of that city, undertook to introduce it under the name Susqueco, the Indian name for the Brandywine.

Brentford Cane (F).—An old English variety of little value.

Brentford Red (F).—Mentioned by Prince in Pomological Manual.

Brentford White (F).—Offered by Prince & Mills in 1822.

Brilliant.—Midseason. Fruit bright, glossy red, large and firm, productive, ripening evenly.

Bristol.—Hardy, vigorous, suckering immoderately. Fruit resembling the Brandywine, but not so large nor firm.

Bromley Hill (F).—An old red, English variety.

Bronze Queen.—Mentioned. Mo. Exp. Sta. Bull. 13 (1891).

Buckeye.—Received at the New York Agricultural Experiment Station, Geneva, New York, in 1910 from W. N. Scarff, New Carlisle, Ohio. Plants hardy, medium in height, stocky, susceptible to anthracnose. Foliage large, dark green. Fruit late, somewhat lacking in size, dark red, with large drupes, giving a coarse, unattractive appearance, slightly crumbly, sprightly, almost tart; not equal to the best kinds; fall-bearing tendency.

Burlington (Prosser) (F).—Originated by Benjamin Prosser, of Burlington, N. J. Downing states that two or three varieties were sent out under this name.

Canada.—Sold by Prince & Mills of Flushing, Long Island, in 1822; also known as Purple Rose-flowering. Possibly *Rubus odoratus.*

Canada Red.—Mentioned by Prince in 1832, as first noticed by him growing along the roadside a few miles from Montreal, where the plants were numerous.

Cardinal (Griesa) (H).—Originated on the grounds of A. H. Griesa, Lawrence, Kans., in 1888, apparently from the seed of the Shaffer. Vigorous, propagating by tips when young, but throwing up some suckers as it grows older. Fruits large, soft, juicy, dark; particularly susceptible to anthracnose.

Carleton.—Mentioned as on trial at the Experiment Station at Agassiz, B. C.

Caroline (H).—Originated with S. P. Carpenter, New Rochelle, N. Y., and supposed to be a seedling of Brincklé's Orange, crossed by Golden-cap. Canes hardy and prolific, but not vigorous. Fruit medium, roundish-oblate, pale salmon, too soft for market, and dull and unattractive when over-ripe. The variety suckers freely, and may also be propagated by tips, with care.

Carpenter No. 1.—Vigorous, early, bright red.

Carter Prolific (F).—An English variety.

Catawissa (H).—Found growing in a Quaker graveyard, at Catawissa, Columbia county, Pa. Brought to notice by Joshua Pierce, of Washington, D. C. Canes strong, branching, with few hooked spines; tender at the North. Fruit dark reddish-purple. Produced fruit in autumn to some extent.

Champlain (F).—A chance seedling found in the garden of Mr. Macomber, of Grand Isle county, Vt. Believed to be from seed of White Antwerp, which it much resembles in the character of its canes. Introduced by Ellwanger & Barry in 1892.

Charles the Bold (F).—Mentioned as one of Arnold's hybrids.—Mich. Exp. Sta. Bull. 111 : 263.

Chester.—Mentioned as good in Michigan.

Christine (F).—A late red variety sent out by E. P. Roe.

Cincinnati Red Antwerp.—Mentioned as grown in Wisconsin about 1874.—Mich. Exp. Sta. Bull. 111 : 263. Perhaps the same as False Red Antwerp.

Citizen (H).—A hybrid between Gregg and Cuthbert, produced by Professor William Saunders, London, Ont.

Clarke (F).—Raised by E. E. Clarke, New Haven, Conn. Apparently one of the best adapted foreign varieties for our climate.

Cline (F).—A chance seedling sent out for trial by G. W. Cline, Winona, Ont., in 1893.

Coleman No. 1.—Fruit small, soft, fine-flavored.

Cole Prolific.—Exhibited at the Chicago Exposition in 1893 by the Fruit Growers' Association of Ontario. Found growing wild on the farm of R. D. Cole, of Port Dalhousie, Ontario.

Colonel Wilder (F).—A seedling raised by Dr. W. D. Brincklé, of Philadelphia, Pa., from seed of the Fastolf, and named in honor of Marshall P. Wilder. Fruit very delicate yellowish white.

Colossal (H).—Sent by I. F. Street, of West Middleton, Ind., to the United States Department of Agriculture, in 1892. A seedling of Shaffer, which it closely resembles.

Columbian (H).—Said to be a seedling of Cuthbert grown near Gregg, on the grounds of J. T. Thompson, Oneida, N. Y. A variety of the Shaffer type, which it very much resembles. A strong, vigorous grower, and very productive. Fruit large, moderately juicy, fairly firm, nearly sweet, somewhat darker in color than the Shaffer, ripening a little later. Columbian has now become the leading commercial variety of the hybrid type.

Cook's Seedling.—Reported by Dewain Cook, of Windom, Minn., as exceedingly hardy and very productive.

Cope (Vice-President Cope) (F).—Originated with Dr. Brincklé,

and named in honor of Caleb Cope, vice-president of the American Pomological Society for Pennsylvania in 1852. Thomas calls it a late sub-variety of the Red Antwerp.

Cornish (F).—An English variety long discarded.

Cox Honey (F).—An old English white variety.

Craig.—A seedling of unknown parentage. Originated by Professor Saunders, of Ontario, and named in honor of Professor John Craig.

Cretan Red (F).—Imported from the Mediterranean by Prince.

Crimson Beauty.—Found by Dr. Stayman, of Leavenworth, Kans., in 1875, growing in a patch of Imperial. Introduced by A. M. Purdy, of Palmyra, N. Y.

Crimson Cluster.—Described.—Ninth Annual Rept. Geneva (N. Y.) Exp. Sta.

Crimson Queen.—A variety offered by L. L. May & Co.

Crystal White (F).—A seedling originated by A. J. Caywood, of Marlboro, N. Y. Fruit light lemon color. Possibly belongs to the purple-cane class.

Cushing (F).—Raised by Dr. Brincklé, of Philadelphia, and named in honor of J. P. Cushing, of Watertown, Mass.

Cuthbert (Conover, Queen of the Market, Quinby's Favorite).—Probably the best known of all red raspberries, and the most desirable single market sort. It was a chance seedling found by Thomas Cuthbert in his garden at Riverdale, now in New York city, about 1865. It is a strong, vigorous, upright grower, sometimes branching; spines short, stout, purplish, rather numerous toward the base, but often wanting toward the tips. Fruit large, dark crimson, obtuse conical, grains rather small and compact. Flesh quite firm, juicy, sprightly, and of fair quality. Its chief defect as a market berry is its color, which is too dark. Mr. Conover, the asparagus man, seeing its value, spread it in his neighborhood, giving it undesignedly the name Conover. In New Jersey it was disseminated by William Parry as Queen of the Market. It is still the leading commercial red raspberry. Ezra Brainerd of Middlebury, Vt., a careful student of the genus *Rubus*, is led to think that Cuthbert has an admixture of foreign blood in its make-up.

Delaware (F).—Said to be an American seedling of the Hornet.

Diadem (F).—Produced by Charles Arnold, of Ontario, by crossing the American White-cap with Franconia, a seedling of this cross with White Four-seasons, and the offspring of this by Hornet, Imperial, and Fontenay, the Diadem being one of the resulting seedlings.

Dictator (H).—Said to be a cross between Shaffer and Gregg, produced by Luther Burbank, of Santa Rosa, Cal.

Donboro.—Originated at the New York Agricultural Experiment Station, Geneva, New York, in 1898, from Loudon x Marlboro. Plants hardy except in the most severe winters, very productive, stockier than either parent. Foliage attractive dark green; berries large, holding up in size during the season, attractive light red, very firm, equal to Marlboro in flavor and quality, ripening in midseason.

Double-Bearing Red (Perpetual-Bearing, Twice-Bearing, Late Liberian, Late Cane, etc.) (F).—Mentioned by Prince and by Bridgeman. Downing says, it was formerly esteemed for its autumn bearing habit, but was then superseded by better kinds.

Downing (F).—A seedling of the Orange, by Charles Downing.

Duhring (F).—A seedling of Hornet originated by Henry Duhring, of Belmont, near Philadelphia.

Dyack Seedling (F).—Imported by Robert Buist, of Philadelphia, about 1840, and known only as a parent of Brincklé's Orange.

Duncan (H).—A hybrid between Gregg and Cuthbert, produced by Professor William Saunders, of Ontario. Fruit large, purple, of better quality than the Shaffer, ripening later. Canes strong, vigorous, propagating both by suckers and by tips.

Early Prolific (H).—A seedling raised from the Philadelphia by Oscar Felton, of Camden county, N. J. Free from thorns. Also an old English variety.

Early Richmond.—Mentioned in Garden and Forest, 1892, p. 458, as grown in Cayuga county, N. Y.

Early White.—Mentioned. Hovey's Mag. of Hort. 1837, p. 23.

Eastern King.—Found by O. A. King, of Deering, Maine, in a garden in the town of Westbrook, about 1864 or 1865. Dull red.

Elizabeth.—One of D. W. Herstine's seedlings, examined and described by a committee of the Pennsylvania Horticultural Society of 1870.

Ellisdale (H).—Found growing wild on the Ellisdale farm, in Iowa, in 1856, by J. E. Johnson. Introduced by H. A. Terry, of Crescent, Iowa. Elsdale, from Nebraska, mentioned in Hovey's Magazine 1865: 122, is probably this.

Elm City.—"A hardy sort. Size and flavor much like Philadelphia. Eight to ten days later than other varieties."—Downing. "A thornless variety, vigorous in growth, hardy and productive. Fruit large, good color, firm and sweet."—Ohio Hort. Soc. Rept. 1807: 114.

Emily (F).—One of Dr. Brincklé's seedlings.

Empire (F).—A seedling of Biggar raised by Prof. William Saunders, of London, Ont.

Empire.—Originated by L. E. Wardell, Marlboro, N. Y., from seed of Ruby, pollinated by Coutant. Said to be healthy, hardy and productive; fruit large, bright crimson, good. New, promising.

English Cane (Twice-Bearing) (F).—For sale by Prince & Mills, of Flushing, L. I., in 1822.

English Giant (F).—Imported from Denmark, by W. D. Barnes & Son, Middlehope, N. Y.

English Globe (F).—Mentioned by Downing.

English Red Cane (English Purple, False Red Cane, Allen).—Mentioned under this name and synonymy by F. R. Elliott as a variety much grown by market-gardeners in 1865.—Mich. Exp. Sta. Bull. 111 : 273. Possibly the same as False Red Antwerp.

English White (Old English Yellow[?]) (F).—For sale by Prince & Mills, of Flushing, L. I., in 1822 at 8 cents each. The White Antwerp sold at 25 cents each, and the American White at 12½ cents each.

Erwood Everbearing.—On trial on the grounds of The Rural New-Yorker in 1879.

Eureka (H).—A seedling of the third generation from Shaffer, larger and brighter red. Originated with Luther Burbank.

Everbearing Red (F).—Mentioned by William Parry in 1869.

Everbearing Tree.—Introduced by Bradley Brothers, Makanda, Illinois. Said to grow in branching, tree form.

Excelsior.—Said to have originated in Wisconsin. A variety of this name, perhaps the same, is reported as worthless in Ohio.

False Red Antwerp (Allen, Allen's Antwerp, English Red Cane,

Kirtland).—In 1828, or thereabouts, an English gardener brought to Cleveland, Ohio, a variety without name. It proved hardy, productive, valuable. The Red Antwerp was then the standard variety, and this sort was called by that name. Later, when the true Red Antwerp came to be known, this one took the prefix "False," and came to be a popular market sort, under the name of False Red Antwerp. Still later, three varieties came to be distributed as this, two of them probably having originated as seedlings in the original plantation. Later F. R. Elliott sent to an occupant of lands of Lewis F. Allen, plants gathered indiscriminately from a plantation of the False Red Antwerp raspberry. In time it was found that the Allen raspberry embraced all the varieties enumerated under the name False Red Antwerp. Professor I. P. Kirtland at one time gave plants of the False Red Antwerp, Fastolf, and Franconia raspberries to Mrs. Follet, of Sandusky, the former being hardy and the latter tender. After a time the tender sorts died out, while the hardy one attracted the attention of H. B. Lum, of Sandusky, who, without knowledge of its character, but knowing that it came from the garden of Professor Kirtland, named and sent it out as a seedling of the Professor's, and under his name.

The botanical relationship of the Allen raspberry is a matter of dispute. Thomas Meehan believed that it belonged to the type of *Rubus Idæus*, while A. S. Fuller thought there could be no question about its being a true *R. strigosus*. It is quite evident that more than one variety must have been known under this name.

Fastolf (Filby) (F).—One of the best English varieties, said to have originated near the ruins of an old castle of that name in Great Yarmouth. First advertised by Yuell & Co., 1843. Figured, Hovey's Mag. 1846: 299. Crozier cites a reference indicating an earlier origin.

Flesh-colored (Frambosier Couleur de Chair) (F).—Said to have been obtained by William R. Prince from the Mediterranean with the Cretan Red, which it resembles.

Fontenay (Belle de Fontenay, Belle d'Orleans, Amazon) (F).—A French variety with stocky, vigorous, somewhat branching canes, suckering freely, especially when young. One of the hardiest and most reliable European varieties. Crozier spells this name Fontenoy.

Four-Seasons Red (Merveille de Quatre Saisons, October Red) (F).—A French variety with a well-developed autumn-bearing habit. Thought by many American cultivators to be the same as Fontenay. The variety imported from Germany by the German Nursery Company of Beatrice, Neb., under the name of Merveille is probably the same.

Four-Seasons Yellow (White Four-Seasons, October Yellow) (F).—Imported from France in 1863 by Charles Arnold, of Paris, Ont. Said to be a seedling of the preceding, and similar to it.

Franconia (Abel, Naomi [?]) (F).—Received from Messrs. Vilmorin, of Paris, many years ago by Samuel G. Perkins. Said to have been little known in European catalogues except as returned from this country. It was one of the comparatively well-known foreign varieties on this side of the water.

French (R. M. Conklin's).—Mentioned by William Parry, in 1869, as declining in favor.

French (Vice-President French) (F).—Raised by Dr. Brincklé, from Fastolf crossed with Yellow Antwerp, and named in honor of B. U. French, vice-president of the Massachusetts Horticultural Society.

French Everbearing (F).—Said to have been imported from France by California nurserymen.

Fulton (F).—A seedling of the French raised by Dr. Brincklé. Named in honor of James D. Fulton, of Pennsylvania.

Ganargua (H).—Found growing wild by Stephen Katkamier, of Farmington, Ontario county, N. Y., about 1867. Described as vigorous, hardy, and productive, possessing the everbearing habit. Fruit dark red, approaching purplish brown. Propagates from tips.

Garden (Doolittle's Red Flavored Black-Cap) (H).—A variety introduced by H. H. Doolittle, of Oaks Corners, N. Y. The Purple-cane raspberry was also known under this name. Whether this is the same, or whether, indeed, it might have been a true black-cap, it is difficult to say.

Gardiner (H).—Mentioned as a new variety of unknown origin, intermediate between the Purple-cane and the black-cap.

Garnet (H).—A seedling of the Philadelphia, produced in 1885 by

Professor William Saunders, of London, Ont. Described as hardy, vigorous, and productive. Fruit purplish red.

General Patterson (F).—A seedling of the Colonel Wilder raised by Dr. Brincklé; named for General Patterson, of Pennsylvania.

Genesee (F).—Red; sent out by Z. H. Harris, of Rochester, N. Y.

Gillard's Seedling (F).—An English sort of good quality.—Fuller.

Gladstone (Carpenter's No. 2, Erie) (H).—A chance seedling, originating with Charles Carpenter, of Kelley's Island, Ohio, who sent it out about 1888, first as Carpenter's No. 2, and then as Erie. Later it was introduced by Green's Nursery Co., of Rochester, N. Y., as Gladstone. Described as vigorous and hardy, producing considerable fruit in autumn. Fruit medium size, dark red, of excellent quality.

Gold.—A yellow variety sent to the Michigan Experiment Station by M. H. Ridgeway, Wabash, Ind.

Golden Alaska.—Introduced by John A. Salzer, of La Crosse, Wis., in 1891. Reported to have been found in Alaska.

Golden Cluster.—Not entirely hardy, making but few plants; fruit golden yellow, juicy, of high quality.

Golden Queen.—This was found on the grounds of Ezra Stokes, of Camden, N. J., about 1883, in a patch of Cuthbert. To all intents and purposes, it is a Cuthbert with yellow fruit. Sports in color from this variety are not uncommon. Instances are recorded where part of the berries on a shoot have been yellow and part red, and even the individual fruits have been variegated. The variety is one of the most satisfactory yellow-fruited sorts, possessing much the same qualities as its parent, the Cuthbert.

Golden Prague (F).—Imported from Denmark by W. D. Barnes & Son, of Middlehope, N. Y.

Grant.—Mentioned in 1869, as a new variety from Auburn, N. Y.

Grape (Mason's Seedling Grape) (F).—Raised from seed by Mr. Mason, a gardener, at Charleston, Mass. Said to have been produced by crossing the Scarlet Rockingham and Red Antwerp.

Grape Vine.—Sent out in 1878 by William Holland, Plymouth, Ind., who obtained his original plants from John German, of Indiana. Ornamental, but of no value for fruit.

Hansell.—A chance seedling found on the farm of Hansell Bros.,

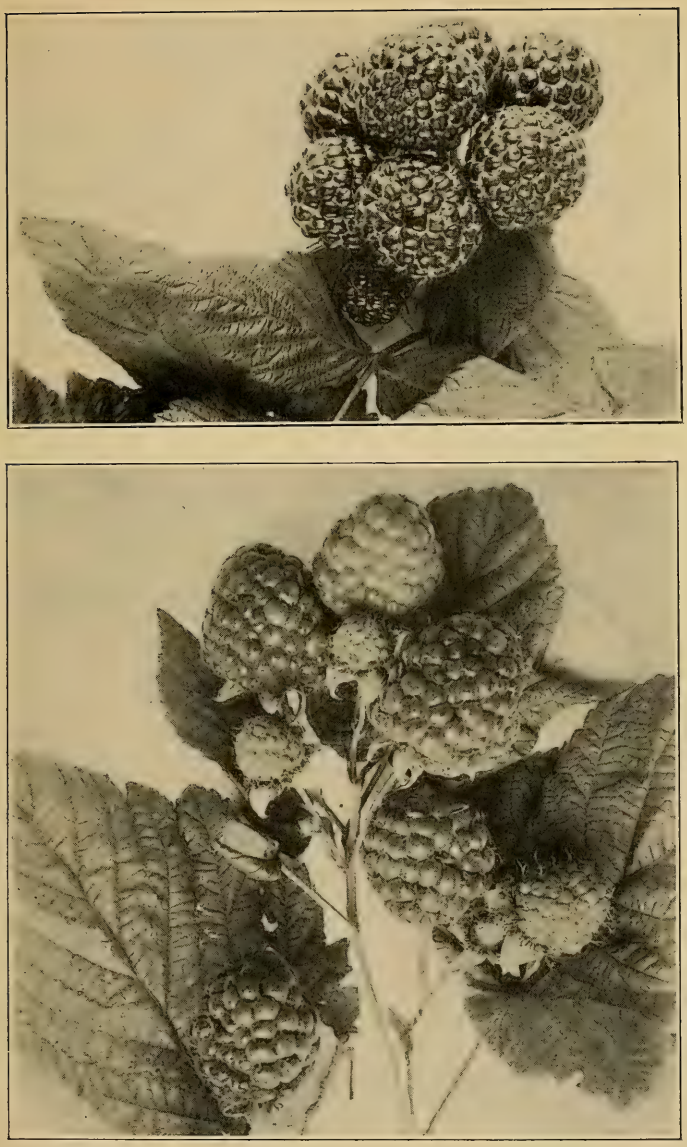

Plate V. Raspberries.—Black Pearl above; Herbert beneath.

near Beverly, N. J., about 1875. Introduced by J. T. Lovett in 1882. Quite prominent at one time as an early variety.

Harris.—Sent out by Z. H. Harris, Rochester, N. Y., in 1889.

Haymaker (H).—Vigorous, hardy and productive. Fruit of high quality, not so dark as Columbian, firmer and said to be larger and not to crumble.

Hawkins Orange.—Of no value.—William Parry.

Heebner (F).—Described by John Craig, at Ottawa, Canada, as a large red berry of the Clarke and Hornet type.

Henrietta (F).—A seedling from Connecticut, introduced by G. H. & J. H. Hale. Said to be similar to Fontenay.

Herbert.—Origin Ottawa, Canada. Very hardy, especially adapted to cold climates. Fruit large, early, bright to deep red, juicy, sprightly and of high quality. Considered one of the best varieties in the Hudson River Valley. Seedlings of Herbert at the Geneva, N. Y., Experiment Station lacked vigor as a rule. (See Plate V.)

Herstine.—This originated with Mr. D. W. Herstine, of Branchtown, Pa., according to whose statement it was raised from seed of the Allen raspberry, which had been planted in alternate rows with the Philadelphia. Described by William Parry in the following words: "As large as Hornet, bright as Pearl, hardy and productive as Philadelphia, and delicious as Allen."

Highland Hardy (Highland Antwerp).—A sport or chance seedling which originated near Highland village, on the Hudson, about 1870.

Hildreth (H).—" Introduced by Isaac Hildreth, of Big Stream Point, N. Y., as a native sort found near that place."—Downing.

Hiram.—Sent out by W. J. Bradt, of Hannibal, N. Y. Thought to be a cross between *Rubus strigosus* and *Rubus Idœus.*

Hornet (F).—A French variety raised by M. Souchet, of Bagnolet, near Paris. Introduced here by Aubrey & Souchet, of Carpenter's Landing, N. J., about 1859. Fig., Gar. Month. 1 : 122.

Howell.—Mentioned by F. R. Elliott in the Transactions of the Ohio Pomological Society for 1865, as being then in cultivation.

Hudson River Antwerp (New Red Antwerp, North River Antwerp) (F).—Said to have been obtained from England by Mr. Bridge, of Poughkeepsie, N. Y. E. P. Roe, in "Success with Small Fruits,"

gives an interesting account of the rise and fall of this variety in the Hudson River Valley.

Hudson River Red.—Exhibited before the Cincinnati Horticultural Society in 1860 by F. W. Slack, of Kentucky, who was then growing it for the Cincinnati market.

Huntsman Giant (F).—A seedling of the Franconia raised by F. W. Huntsman, of Flushing, N. Y., who grew many seedlings, hoping to gain a hardy variety equal to the more tender kinds.

Hybrid Crimson Mammoth (H).—Found wild at Adams, N. Y., by Dr. E. R. Maxson, who brought it into cultivation.

Idaho.—Found growing in an old garden in Idaho. Plant stocky, branching, not very tall, producing less suckers than most varieties; very hardy. Fruit large, shaped like a black-cap, deep rich red, ripening from July to October, producing more in autumn than most so-called everbearing sorts.

Imperial (F).—A large French variety introduced by Aubrey & Souchet, of Carpenter's Landing, N. J.

Imperial Red (Red Imperial).—A variety grown in New Jersey.

Imperial White (F).—Catalogued by Ellwanger & Barry, in 1860.

Iowa (Eaton).—Found in Iowa. Named and introduced by M. J. Wragg. Rather dwarf, canes strong, thornless, leaf dark and heavy. Early, productive, large, rich dark red, of excellent quality but tends to crumble. Fruit sometimes attacked by mildew when ripe. More generally catalogued under the name of Eaton.

I. X. L.—A chance seedling discovered by Charles Schlessler, of Naperville, Ill., in 1887.

Johnson.—Received from Cincinnati by E. Y. Teas, of Indiana, in 1875, and reported to be much like the Philadelphia.

June.—This variety is the result of a cross between Loudon and Marlboro, in 1897, on the grounds of the Geneva, N. Y., Experiment Station, and disseminated from there in 1909. Described as more vigorous than either of its parents and equally hardy. Plant upright, healthy and very productive, producing but few suckers. Begins ripening the last of June at Geneva and continues through a long season. Fruit bright red, larger than Cuthbert but less conical, holding its size unusually well till the end of the season, firm, keeping and shipping well, quality excellent.

Jouet (F).—A French variety introduced here by Aubrey & Souchet.

Kenyon.—Introduced by O. A. Kenyon, of McGregor, Ia., who found it growing among black raspberries about 1885. Thought to be identical with Loudon as grown at the Mich. Exp. Station.

Keystone.—Originated with A. L. Felten, of Philadelphia, Pa.

King (Thompson's King) (F).—Sent out by the Cleveland Nursery Co., of Rio Vista, Va., in 1892. Early, round, light crimson, juicy and good. Grown from seed by T. Thompson, Richmond, Va.

Kirtland.—See False Red Antwerp.

Knevett Giant (F).—Imported from England by Marshall P. Wilder in 1843, having been received as a present from Messrs. Chandler & Co., of Vauxhall, who stated that the ones they gave to Mr. Wilder were all they had ever had.

Kreigh.—Brought to notice about 1880.

Lady Ann (F).—A seedling of Biggar Seedling, produced by Professor William Saunders, of London, Ont.

Large-fruited Monthly (Rivers's Large-fruited Monthly, Rivers's New Monthly) (F).—Said to have been imported from the continent to England by Thomas Rivers, in 1847. Brought here later.

Large White.—Mentioned. Hovey's Mag. Hort. 1837: 23.

Lindley.—Raised by Joseph B. Lindley, of Newark, N. J., early in the sixties. Said to be a hybrid between the Fastolf and the Native Red.

Linton (Red).—Mentioned about 1870.

Little Prolific (H).—A red variety originated with John Little, of Ontario. Sent out in 1883. *Probably Rubus neglectus.*

Longworth (F).—One of Dr. Brincklé's Seedlings.

Lord Beaconsfield (F).—Mentioned as an English variety on trial at the Experimental Farm at Agassiz, B. C.

Lost Rubies (F).—A variety said to have been found growing in a bed of Naomi, by A. M. Purdy, and sent to Charles A. Green, of Rochester, N. Y., who introduced it. Regarded by many as identical with Naomi.

Loudon.—Originated by Frank W. Loudon, of Janesville, Wis., who states that it is a seedling of Turner crossed by Cuthbert. Canes vigorous, hardy and productive. Berry large, somewhat conical.

Grains large, with a suture, firm and of a good red color, but not equal to Cuthbert in quality. Introduced by Charles A. Green, of Rochester. Prominent at one time.

Magnum Bonum (F).—Introduced from England about 1840. Said to be similar to, if not the same as, Yellow Antwerp.

Manitou.—Grown in Illinois. Similar to Cuthbert.

Marion's Favorite.—Mentioned. Proc. N. J. Hort. Soc. 1900: 195.

Marlboro.—A popular variety originated by A. J. Caywood, of Marlboro, N. Y., who described it as "A cross of the Highland Hardy, and a seedling started from English Globe and the Hudson River Antwerp thirty years ago. It is a larger grower, with stronger canes than any known variety; hardy in the fullest sense; berries averaging three-quarters of an inch in diameter, and when not retarded by long, severe drought, many of them will average one inch. It will remain four days on the bushes after ripe, and is then marketable. It is bright crimson in color, and does not lose its brilliancy when over-ripe." This is one of the best known and most generally prized early market sorts. Hardy, vigorous, productive, and a thoroughly good, all-round berry. The leading market variety in some localities, especially along Lake Erie.

Marldon.—A seedling produced at the Geneva, N. Y., Experiment Station by crossing Marlboro with Loudon. Plants were distributed during the spring of 1908. The plants are described as of Marlboro type but more vigorous and stockier, producing many suckers and soon likely to become crowded. Hardy, productive and healthy. Fruit large, retaining its size well as the season advances, but ripens in a comparatively short time, about one week ahead of Cuthbert, firm, dark red, of fair quality.

Mary.—Raised from seed by Professor William Saunders, of London, Ont. Fruit light red, as large as Cuthbert.

May Orange.—Offered for sale by L. L. May & Co.

Mendocino.—A Pacific coast variety. Said to have originated in Mendocino county, Cal.; used by Luther Burbank, in the production of some of his seedlings.

Meredith Queen.—Discovered growing wild in the town of Meredith, Delaware county, N. Y., in 1880, by E. J. Brownell, who sent out plants for trial in 1883. Bearing canes dark brown; new growth

purplish green, tips red; suckers freely. Fruit of pale orange or reddish salmon color. A strictly native red raspberry except in color.

Merkel (H).—Described as hardy and productive, not throwing up suckers. Fruit firm, with somewhat of a currant flavor. Darker than Cuthbert, resembling Gregg in shape and size.

Michigan (Michigan Early).—Introduced about 1883 by William Parry, of New Jersey. It was generally supposed to have originated in Michigan, though William Parry, Jr., is under the impression that the first plants came from Tennessee.

Miller (Miller's Woodland).—A popular variety at one time in the Delaware peninsula. Origin same as the Brandywine. Described as strong, stocky, hardy and productive. Fruit large, bright crimson, firm, sprightly, subacid, of excellent quality. Resembles Brandywine but ripens earlier.

Miller Favorite.—Mentioned as on trial at the Michigan Experiment Station in 1887.—Bull. 111 : 291.

Minnesota No. 1.—A seedling of King x Loudon, introduced by Charles Haralson of the Experimental Sub-station at Excelsior, Minn. Similar to No. 4 but ripening about a week earlier.

Minnesota No. 4.—Of the same origin and parentage as the preceding. Considered one of the hardiest of raspberries, a strong grower and resistant to disease. Fruit ripening about a week later than King, much larger than either parent, dark red, of fair quality and very firm, standing long shipments well and being one of the best market varieties in Minnesota.

Minnetonka.—A red raspberry originated about 1890 by F. J. Empenger, Maple Plain, Minn., who had Turner, Cuthbert and wild red raspberries growing together. He dusted pollen from a branch of the wild berries on Turner and Cuthbert, from the Turner on the wild and on Cuthbert, and from Cuthbert on Turner and the wild plants. He used seed from all three, mixing it for planting, and secured the Minnetonka among the seedlings.

Mohler No. 1.—Mentioned as a red variety on trial at the Indiana Experiment Station.

Montclair (H).—Originated on the grounds of E. and J. C. Williams, Montclair, N. J., and supposed to be a seedling of the Philadelphia.

Mote Everbearing (H).—Raised by L. S. Mote, of West Milton, Ohio. An everbearing variety resembling Catawissa.—Downing.

Mrs. Ingersoll (F).—One of Dr. Brincklé's seedlings. Yellow.

Mrs. Wilder (F).—A seedling of the Colonel Wilder, similar in color. Named by Dr. Brincklé.

Mrs. Wood (H).—Originated with Mrs. Reuben Wood, near Cleveland, Ohio.

Muriel (F).—A seedling raised from Biggar Seedling by Professor Saunders.

Muskberry.—Sent out by John Lewis Childs of Floral Park, N. Y. An extremely rank grower, spreading badly from the roots and becoming a nuisance. Fruit of good size and attractive but insipid and disagreeable. A musky odor is thrown off by the plants.

Muskingum (Shaffer's Sister, Melott's Favorite) (H).—Originated in the orchard of Mrs. Simeon Ellis, Coshocton county, Ohio, near the Muskingum River. Named and introduced by James Madison, of Chili, Ohio. Similar to Shaffer, but not as tall.

My Seedling.—Mentioned by George J. Kellogg in the Report of the Wisconsin Horticultural Society for 1887, p. 241.

Naomi (F).—Said to have been produced from seed sown by Mrs. Governor Wood, of Rockport, Ohio, about 1850. Introduced by F. R. Elliott. The question of the identity of this variety with the Franconia was investigated by a committee of the Ohio State Horticultural Society in 1868. It was found that the stock sent out from Mrs. Wood's place was badly mixed. She grew seedlings from the Red Antwerp and Franconia, and from the mixture distributed plants. The sort which proved the best, and thus came to survive as the true Naomi, was doubtless the Franconia itself, or a seedling of it, which was so nearly like the parent as to be indistinguishable from it.

Narragansett (F).—A seedling of Brincklé's Orange raised by John F. Jolls, of Providence, R. I.

Nebraska.—Mentioned in 1869, as no longer popular.

Newark.—Mentioned as on trial in 1892, at the Oklahoma Experiment Station.

New Everbearing (F).—Noticed. Proc. Cincinnati Hort. Soc. 1861.

New Prolific.—Mentioned. Rep. Kan. Hort. Soc. for 1884.

New Rochelle (H).—Supposed to be a seedling of the Catawissa. Raised by S. P. Carpenter, New Rochelle, N. Y., and apparently introduced by E. W. Carpenter, of Rye, N. Y., though the Country Gentleman for 1881 speaks of it as having originated with W. S. Carpenter.

Niagara.—A Canada variety of good flavor and texture; color dark.

Northern Wonder.—Spoken of as an excellent variety found by one of the Feltens.—Gar. Month. 13 : 246.

Northumberland Fillbasket (F).—English. Introduced about 1855.

Norwalk (F).—Introduced in 1879, by Mallory & Downs, of South Norwalk, Conn. Thought by Lovett to be the same as Naomi and Franconia.

Norwood (Norwood's Prolific) (H).—A variety originated in Massachusetts, propagating by tips. Fruit similar to Philadelphia.

Nottingham Scarlet (F).—An old English variety, introduced before 1850 by Marshall P. Wilder.

Ohta.—A variety selected by Professor Hansen of South Dakota from a lot of 6000 hybrid seedling raspberries. It is the result of crossing a wild red raspberry from North Dakota with Minnetonka. It is described as hardy and very productive, with beautiful red fruit, which is fairly firm and of good quality. Introduced as a variety adapted to the rigorous climate of the Dakotas. Ohta is the Sioux Indian name for much or many.

Olathe (Stayman's No. 5).—Originated by J. Stayman, of Leavenworth, Kans., from seed of Reliance.

Orange (Brincklé's Orange) (F).—This noted variety originated with Dr. W. D. Brincklé, of Philadelphia, in 1845. It long represented the ideal quality to be sought in the raspberry. Roe speaks of it as a hybrid between *Rubus Idæus* and our native species. It was raised from seed of Dyack Seedling, an English variety of deep crimson color, but what the staminate parent was does not now appear. According to Dr. Brincklé, it reproduced itself generally from seed. It is described as essentially an Antwerp, but more vigorous. Fruit of a beautiful buff color, and delicious flavor. It did not thrive under hot suns or upon light land, succeeding south of New York

only in cool, moist soils and in shady locations. It always required winter protection.

Osceola.—Originated in Osceola county, in northwestern Iowa.

Palluau (F).—A French variety, described by Downing.

Papier (F).—An old French variety. Known also as Le Noire or Tue-Homme. Introduced about 1820 at Bagnolet, near Paris.

Parnell (F).—Said to be a seedling of Merveille des Quatre Saisons, raised by Mr. Parnell, of Cincinnati.

Parry's Nos. 1 and 2.—Originated with William Parry, of New Jersey, but not considered by him worth introducing.

Patrician (F).—A temporary name applied by E. P. Roe to a variety imported from France by Mr. Downing.

Pearl (Red Pearl).—Origin unknown. Cultivated considerably about Philadelphia at one time.

Pennsylvanian.—A variety mentioned by Prince, in the Pomological Manual, as obtained from a London nursery under the name *Rubus Pennsylvanicus*, but which he had later found to be identical with plants received from the forests of Maine.

Percy (H).—A hybrid between Gregg and Cuthbert, produced by Professor William Saunders, of London, Ont. Much like Shaffer.

Perfection.—Originated by F. W. Loudon, of Janesville, Wis., and said to be a cross between Cuthbert and Turner. Described as productive, large, handsome, of good color and flavor but not so firm as Cuthbert.

The name is also applied to a variety said to have originated in the Hudson River Valley and described as much like the old Brandywine, a good grower, hardy and a heavy yielder but inclined to drop if not picked closely. Fruit of good size, bright red, firm.

Philadelphia (H).—A chance seedling, found wild near Philadelphia, Pa., about 1835, which proved itself to be hardy, productive, and well suited to light soils in the southern portions of the Middle states. Described as vigorous, tall, branching, almost free from spines. Fruit medium, roundish, dark crimson or purplish red; flesh rather soft, moderately juicy, mild subacid.—Downing. This variety resembles *Rubus strigosus* much more closely than do the Catawissa, Shaffer, and others of the true Purple-cane type; yet it is evidently intermediate between the red and black raspberries, and

not a true red raspberry. Although propagating by suckers, these are produced but sparingly, and the fruit is darker in color than the true red raspberries. Occasionally it will root at the tips.

Phoenix.—Fairly productive; fruit of good size, rich dark red, of high quality. Early and promising.

Pilate (F).—A French variety, imported by Aubrey & Souchet.

Pomona.—Introduced by William Parry about 1887. One of the most uniformly productive varieties grown at the Geneva (N. Y.) Experiment Station. Of vigorous growth and fine appearance. Fruit a pleasing red, large and firm. Season very long.

Pride of Kent (F).—Originated by Mr. Fallstaff, of Kent, England. Imported about 1887 by Henry King, of Jefferson, Colo., and introduced in 1892 by R. S. Edwards, of Highland, Colo.

Pride of the Hudson (F).—A chance seedling, which originated in the garden of T. H. Roe, of Newburg, N. Y., about 1872, and gave unusual promise. It was propagated and introduced by E. P. Roe.

Prince Globose (F).—Raised by W. R. Prince, of Flushing, L. I.

Prince of Wales (Cutbush's Prince of Wales) (F).—An English variety, mentioned by Downing.

Princess Alice (F).—Fuller speaks of this as a new English variety, raised by Cutbush & Son, of Highgate, England.

Prolific Red (F).—Described by Prince in 1832.

Pullman.—A variety mentioned as on trial at the New York Experiment Station about 1884.—Mich. Hort. Soc. Rept. 1884 : 251.

Purple Cane (Purple Prolific, English Purple, Red Prolific, American Red Cane, Garden Raspberry, Huntsville, English Red, Allen and English Brown erroneously) (H).—This is probably the oldest cultivated variety of this type. It was grown about New York at least one hundred years ago. It is supposed to have been a native variety. Described as having strong, tall, recurved canes, often branching, reddish purple. Spines rather long, stiff, and moderately numerous. Berries small, purple, good, but too soft for market.

Purple Dulcet (H).—Mentioned. Ill. Hort. Soc. Rept. 1875 : 268.

Queen Marguerite.—A red variety on trial in Michigan about 1885.

Rancocas.—Introduced by William H. Moon, of Morrisville, Pa.,

in 1884. Originated as a seedling on the farm of J. S. Hansell, taking its name from the place of its origin, on the Rancocas Creek.

Ranere (St. Regis).—Grown in New Jersey for a time by a colony of Italian gardeners as Ranere. Later introduced by J. T. Lovett under the name St. Regis. Canes stocky, vigorous, hardy and productive, bearing both on young and on old canes. Early and continuing to ripen until October. Fruit bright crimson, rich, sugary, meaty and a good keeper. Introduced as an everbearing but chiefly valuable for its main crop.

Red Antwerp (Old Red Antwerp, Knevett's Antwerp, True Red Antwerp, Howland's Red Antwerp, Frambosier â Gros Fruit, Burley) (F).—One of the oldest European varieties. It is supposed to have derived its name from the city of Antwerp, in Belgium, though the plant itself is said to have come from the Island of Malta. It is one of the best of the European sorts, and is still grown, even for market, in the United States. Described as having strong, long, yellowish green canes, slightly glaucous, tinged with purple, covered with dark brown bristles. Bearing wood nearly smooth. Fruit large, conical, dark red, rich and sweet. Many other varieties have received this name at times. It is figured in the Report of the United States Department of Agriculture for 1866.

Red Cane (F).—A favorite market variety at one time in the vicinity of Hartford, Conn. Introduced there without name, and was probably some well-known variety like the Hudson River Antwerp, or true Red Antwerp.—Mich. Ex. Sta. Bull. 111 : 303.

Red Cluster.—Described by T. T. Lyon in 1893 as late, of medium size and of good quality.

Re(e)der.—A seedling found near Stevensville, Mich., about 1875.

Redfield (H).—Introduced by the Iowa Seed Company, of Des Moines, 1895. Discovered on the farm of D. W. Humphrew, near Redfield, Iowa. Resembles Shaffer.

Red Jacket.—A recent introduction, closely resembling Cuthbert both in plant and fruit, but ripening later and in a shorter period of time. Va. Exp. Sta. Bull. 147.

Red Queen.—Mentioned as no longer popular in 1869.

Red Sweet (F).—Imported from Denmark by W. D. Barnes & Son, of Middlehope, N. Y.

Reliance (H).—A descendant of Philadelphia, raised by O. L. Felten, of N. J.

Richardson.—Mentioned as an inferior variety cultivated in the West.—Gar. Month. 1862 : 339.

Rider.—Mentioned. Amer. Pom. Soc. Rept. 1891 : 119.

Ridgeway.—From M. H. Ridgeway, Wabash, Ind. Thrifty but unproductive at the Michigan Experiment Station.

Riley's Early.—A variety from New Jersey.—Downing.

Rivers Orange (Large Orange, River's Yellow) (F).—Raised by Thomas Rivers, of England.

Royal Church.—Originated on the farm of Royal Church, of Harrisonville, Ohio, near Herstine and Philadelphia. Fruit dark crimson. May belong with the *Rubus neglectus* group.

Royal Purple (H).—Originated in Indiana. Claimed to be unusually hardy, having withstood 35 degrees below zero uninjured. Vigorous, productive, ripening late, canes nearly thornless. Fruit large, very firm, easily picked and stands marketing well.

Ruby.—Raised by D. W. Herstine. Canes strong, light green, shaded with purple, bearing very few spines. Fruit large, round, dark crimson.

Ruby.—A seedling of Marlboro, which it closely resembles. One of the best market varieties in the Hudson River Valley.—R. N. Y. 1910 : 1005.

Russell Red.—Raised by Dr. G. W. Russell, of Hartford, Conn., from seed of the White Antwerp, grown near Red Cane.

Salzer Everbearing Red (H).—Origin Illinois. Introduced by the John A. Salzer Seed Co., Lacrosse, Wis., as a cross between the Shaffer and the Marlboro.

Sarah (H).—Originated by Professor William Saunders, London, Ont., from seed of the Shaffer. A moderate grower, suckering freely, and propagating only that way.

Saunders Hybrid (No. 53?) (H).—A hybrid between Philadelphia and Mammoth Cluster, produced by William Saunders, of London, Ont. Said to propagate from tips only.

Scarlet.—Under this name was disseminated a sort found mixed with the Allen as sent out. Fuller thought it likely to be Allen's Prolific.

Scarlet Gem.—A seedling of the Crimson Beauty, originated by Dr. J. Stayman, of Leavenworth, Kans., in 1876.

Segrist.—A chance seedling found among plants of Kansas by Samuel Segrist, Holton, Kansas, in 1903, and introduced by F. W. Dixon of that place in 1912. Plants stocky, healthy, productive; foliage large, thick, dark green; berries above medium in size, uniform, roundish-conic, medium red, attractive, firm; good in quality, ripening late.

Semper Fidelis (F).—An English variety, mentioned in Hovey's Magazine as new in 1863.

Shaffer (Shaffer's Colossal) (H).—This is one of the best known varieties of this type. It originated in the garden of George Shaffer, near Scotsville, Monroe county, N. Y., about 1871. Introduced by Charles A. Green, of Rochester. It is a vigorous, upright grower, and one of the most productive raspberries known. Fruit large, dark red or purple, moderately firm, sprightly, subacid. Its color is too dark to be attractive, but if picked before fully ripe, while yet red, it looks fairly well in market. An excellent canning variety. It also dries well, being of more attractive color when dried than true red raspberries, and producing more pounds of dried fruit per bushel. In quality it is not far behind the red raspberries, with a richness not possessed by them.

Shaffer Seedling No. 5 (H).—A seedling of Shaffer, mentioned as on trial at the Rhode Island Experiment Station.

Sharpe (F).—A seedling of unknown parentage, produced by Prof. William Saunders, of London, Ont. Similar to Heebner.

Shipper's Pride.—Hardy, productive and an excellent shipper.

Short-jointed Cane.—Described by Prince, in the Pomological Manual published in 1832, as almost spineless, with close, jointed canes. Crozier refers it to *Rubus strigosus.*

Silver Queen (F).—A yellow variety, sent out for trial in 1885 by Robert Johnston, of Shortsville, N. Y., who obtained it from L. M. Macomber, of Vermont, under the name "Silver Skin."

Sir John (F).—A seedling of Biggar's Seedling, produced by Professor William Saunders, of Ontario.

Smith Purple (H).—Originated with B. F. Smith, of Lawrence, Kans. Has all the black-cap characteristics except color.

Souchetti (White Transparent) (F).—Raised by Messrs. Souchet, near Paris; introduced here by Aubrey & Souchet.

Spring Grove (F).—Mentioned by Fuller.

Stayman No. 1 (H).—A seedling of Shaffer originated with Dr. J. Stayman, of Leavenworth, Kans., in 1884. Canes upright with few laterals, hence lacking in productiveness. Fruit large, rich dark red, of good quality.

Stayman No. 2.—Mentioned. Mo. Hort. Soc. Rep. 1883 : 203.

St. Louis.—A popular variety in the vicinity of St. Louis, Mo., about 1867.

Stoever.—A form of the American Red, found wild near Lake Dunmore, Vermont, by Jefferson F. Stoever, who removed and fruited it near Philadelphia, in 1859.

Sucre de Metz (F).—A white, foreign variety introduced by L. Ritz, of Ohio, in 1869.

Sunbeam.—Introduced by N. E. Hansen of South Dakota, the only one saved from a batch of several thousand seedlings. Vigorous, perfectly hardy in Dakota, sturdy and upright in growth. Fruit bright crimson, firm and of good quality.

Superb (F).—Mentioned by Fuller as an old, foreign sort.

Superb (Churchman's Superb) (H).—Originated by John Churchman, of Burlington, N. J., and supposed by him to be a seedling of Philadelphia. Propagates by suckers.

Superb d'Angleterre (F).—Also mentioned by Fuller.

Superlative (F).—Introduced by Ellwanger & Barry, of Rochester, N. Y., in 1892. Described as hardy, with stout canes. Fruit large, conical, handsome dull red, of very fine flavor.

Surpasse Merveille (F).—A French seedling of the Merveille de Quatre Saisons. Offered in France in 1862.

Surprise (F).—A chance seedling of the Franconia, which originated in Montgomery county, N. Y.

Surprise (H).—Introduced by H. G. Breese, Hoosick, N. Y.

Surprise d'Automne (F).—A white variety of *Rubus Idœus*, introduced by L. Ritz, of Ohio, about 1869.

Sweet Yellow Antwerp (F).—Mentioned by Downing.

Syracuse.—An accidental seedling, springing up in a garden at Syracuse, N. Y. Introduced by Green's Nursery Company, Roches-

ter, N. Y. Bushes medium in vigor, not fully hardy, with large, rugose foliage; susceptible to anthracnose. Berries very large, light red, not very firm, sweet, good, late.

Talbot (F).—Originated about 1885 with J. W. Talbot, of Norwood, Mass., who had been growing Herstine and Fontenay.

Talcott.—Sent out for trial by G. H. & J. H. Hale of Connecticut, in 1883. Much like Turner except in form.

Tall Red Cane.—Described by William Prince, about 1832, as productive. Canes covered at the base and extremities with numerous fine spines or hairs.

Taylor Paragon (F).—Mentioned by Fuller as discarded.

Thompson Early Pride.—Sent out in 1888 by the Cleveland Nursery Co.

Thompson Early Prolific.—Also sent out by the Cleveland Nursery Co.

Thunderer (F).—Mentioned by Thomas, resembling Franconia.

Thwack.—Introduced by T. W. Foster, of Louisiana, Mo., as obtained from T. S. Wilson, of New York, who claimed it to be a cross between Herstine and Brandywine. Attained some prominence as a market berry.

Trusty.—A variety of unknown origin, on trial in Canada.

Turkish Turban (F).—Mentioned in Hovey's Magazine, 1842: 368.

Turner (Southern Thornless, Red Thornless, Southern Red, Baldwin's Choice, Balding's Choice).—Originated by Prof. J. B. Turner, of Jacksonville, Ill. A full account of its origin is given in E. P. Roe's "Success with Small Fruits." Long one of the most popular varieties, and still grown. Very hardy, vigorous; canes golden reddish-brown, overspread with a purple bloom. Almost free from spines. Fruit large, bright crimson, roundish conical, soft, sweet, and of excellent flavor. The distribution of plants by a man named Baldwin undoubtedly caused it to receive the name Baldwin's Choice, evidently corrupted to Balding's Choice.

Twentieth Century.—Said to be a seedling found in a garden near Marlboro, Ulster County, N. Y. Plants were secured by L. L. Woodford, Syracuse, N. Y., in 1905, who four years later named it Twentieth Century. Plants medium in vigor, usually showing some

winter injury, productive. Foliage large, dark green, crumpled. Fruit late, large, bright red, somewhat soft, sprightly, good.

Vermont (F).—A seedling of the Champlain. Originated by L. M. Macomber, of North Ferrisburgh, Vermont.

Victoria (Rogers' Victoria, Victor) (F).—Imported by William R. Prince.

Virginia Red.—A variety mentioned by Prince in the Pomological Manual, published in 1832.

Walker (F).—One of Dr. Brincklé's seedlings.

Watson.—Midseason.

Wauregan.—Mentioned in "Rural Affairs," vol. 8, p. 81.

Waterloo.—Mentioned among the varieties planted for trial at the Mississippi Agricultural College in 1888.—Mich. Exp. Sta. Bull. 111 : 318.

Welch.—Described as vigorous, hardy and productive. Fruit large, bright crimson, melting and so sweet and rich that it has been known as the Honey raspberry.

Welsh.—A seedling raised by Isaac Welsh, of Camden county, N. J.

Wetherbee (H).—A variety from New York, with small, round, purple fruit.

White Canada.—Raised by Charles Arnold, of Paris, Ontario. Canes brownish yellow; spines white. Pale yellow, of decided Antwerp flavor.

White-fruited.—A white-fruited form of *Rubus strigosus*, sent to the Cornell University Experiment Station, by A. S. Fuller.

White Mountain (Red).—Tender, late, unproductive.—Mass. Hatch Exp. Sta. Bull. 21 : 10.

Williams Preserving (F).—An old English variety.

Wilmot Early Red (F).—Mentioned by Fuller as an old English variety.

Winant.—A seedling raised in New Jersey. Introduced by Frank Ford & Son, of Ravenna, Ohio. Said to resemble Thwack.

Woodward (F).—One of Dr. Brincklé's seedlings.

Woodward Red Globe (F).—Fuller speaks of this as an old English variety cultivated in England about forty years previous.

Worthy.—Introduced by J. H. Hale. Hardy, early, productive.

Yellow Antwerp (White Antwerp, Double-bearing Yellow) (F).—Canes and fruit yellow. A variety long known.

Yellow Chili (Chili Monthly) (F).—A French variety mentioned by Fuller, having little value.

Recommended varieties.—Cuthbert is still far in the lead as a market red raspberry, being widely grown the country over. Marlboro is popular along Lake Erie and Herbert in the Hudson River Valley, while Loudon is still grown for market in some localities. Ranere has been gaining ground rapidly in recent years, especially in New Jersey. Sunbeam and Ohta are especially adapted to the trying climate of the northern prairie states. June is promising as a very early variety in New York.

Columbian is now the leading variety in the hybrid group. Royal Purple is a newer claimant for public favor in this class.

CHAPTER VIII

VARIETIES OF BLACKBERRIES AND DEWBERRIES

Blackberries and dewberries are recent in cultivation. In many parts of the country they are still to be found wild in such abundance that there is little incentive to grow them. Having been developed from native species, the number of varieties is not so great as with the raspberries. There has been some falling off in the area devoted to these fruits in recent years in the eastern states as shown by census statistics, but on the Pacific coast their cultivation has increased. This is apparently due to the introduction of the loganberry and its popularity. While typically distinct, the dividing line between blackberries and dewberries is not well defined, many intermediate forms occurring which pass in easy grades from one to the other.

THE BLACKBERRIES

The blackberry family is exceedingly variable. Within the limits of species properly called blackberries and dewberries may be found an almost endless variety of forms. Little wonder that it has offered a fertile field for the species-maker. With specimens at hand he may name and describe form after form to his heart's content. But when he comes to visit them in their na-

tive haunts, rather than in the herbarium, he is likely to find them mingling and intermingling, varying and shading, even crossing and recrossing, in the greatest freedom and abandon, in utter disregard for his carefully defined types.

The cultivated American blackberry is a product of this intermingling of types. So confused is its origin that to attempt to classify varieties with reference to the particular species from which they have sprung is well-nigh impossible, and certainly not worth the while. Even to separate the blackberries from the dewberries is not easy, for they too intermingle to a greater or less extent, passing in easy grades from one to the other. Probably the foundation species for the greater number of varieties is the one now known as *Rubus argutus*, Link. This is a rather stiff, erect form with very prickly or thorny canes, the thorns extending to the stems and ribs of the leaves; flower-clusters short, usually free from glands. Found from Canada to North Carolina and Iowa. *Rubus floridus*, Tratt., is a taller-growing plant, with decumbent or recurving branches and stout curved prickles. The flower-clusters are loose and leafy, bearing only a few flowers, the fruit being long, with small drupelets. This form occurs from Virginia southward and westward. *Rubus frondosus*, Bigel., is of medium height with mostly straight prickles; the leaflets are broad and hairy beneath, the flower-clusters short, hairy, with only a few simple leaves or bracts intermingled. *Rubus allegheniensis*, Porter, is a mountain form of medium height, with moderately curved prickles, leaflets glandular-pubescent beneath, flower-clusters long, glandular-hairy but not

leafy. Fruit usually long, thimble-shaped, rather small, narrowing toward the tip: drupelets small and numerous. Another mountain form common in the Allegheny region is *Rubus canadensis*, Linn. (*R. Millspaughii*, Brit.) This is a tall nearly thornless species bearing short thick berries, jet black in color but more sour than the lowland types. This species appears not to have been brought into cultivation.

The blackberry of the garden is little more than a child of the brush-land and forest, forced into domestication, and all of the above wild types, with the exception of the last mentioned, appear to have contributed to different varieties now under cultivation. That the smooth mountain berry is not also included is doubtless the result of accident rather than purpose. It is a productive type in its wild state; its glossy black fruit is attractive and often large, while its comparative freedom from thorns is a point in its favor. These qualities offer something of promise to be combined with the higher quality of fruit found among other types. In its wild state this mountain berry ripens later than other blackberries, partly due to elevation at least. It reaches its greatest perfection in the high mountains of the Appalachian system. It is often found in dense forests, where the canes sometimes reach a height of fifteen or eighteen feet, and are as thornless and smooth as a willow twig. In such localities the fruit is said to be greatly appreciated by the mountain bears, which are enabled to draw down the smooth canes and fatten upon the berries for their long hibernating sleep during winter.

The sand blackberry, *Rubus cuneifolius*, Pursh, found

in the southern states, was formerly thought to have been the parent of at least one cultivated variety, but Bailey now believes that the species has not entered into the development of the garden berry. This is a short, stiff plant covered with strong hooked thorns, with leaves which are woolly white beneath.

History and Future of the Blackberry

The blackberry or bramble of Europe appears to have been little prized as a fruit-bearing plant. It is occasionally mentioned as useful for tarts or similar articles of diet, especially if apples are added to give spice and flavor. The fruit is evidently inferior in flavor and quality to that of our own species. It is doubtless chiefly due to this fact that the blackberry of cultivation has been developed from American types.

The following account of blackberry history is quoted from an article at one time contributed by the writer to "The American Garden."

In its early history, other qualities seem to have been considered more important than its fruit. According to Pliny, the ancients were taught by means of the bramble bush how to propagate trees by layers. It was, no doubt, held in greatest esteem, however, for its supposed medicinal qualities. "The berries," says Pliny, "are the food of man, and have a dessicative and astringent virtue, and serve as a most appropriate remedy for the gums and inflammation of the tonsils." Both the flowers and berries were thought by the ancients to be remedies against even the most venomous serpents. Pliny further states that "the juice pressed out of young shoots, and reduced to the consistency of honey, by standing in the sun, is a singular medicine taken inwardly, or applied outwardly, for all

diseases of the mouth and eyes, as well as for the quinsy." The roots, boiled in wine, were esteemed one of the best astringents by Roman physicians, and used in all diseases of the mouth. The leaves, pounded and applied to ringworms and ulcers, were said to bring speedy relief. Boerhave, a renowned physician at the beginning of the last century, affirms that the roots, dug in February or March and boiled with honey, are an excellent remedy against dropsy. In a work entitled "A Niewe Herball, or Historie of Plantes," first written by D. Rembert Dodoen, physician to the German emperor, and afterward translated into French, then from French into English by Gerard Dewes, in 1578, the "nature" of the blackberry is set forth as follows: "The tender springes and new leaves of the Bramble are colde and drie almost in the thirde degree, and astringent or binding, and so is the unripe fruite. The ripe fruite is somewhat warme and astringent, but not so much as the unrype fruite." Then are given a long list of "vertues," among which are the following: "They do also fasten the teeth, when the mouth is washed with the juyce or decoction thereof. The unripe fruite is good for the same purpose, to be used after the same manner." "The leaves be stamped & with good effect are applyed to the region or place of the stomacke against the trembling of the hart, the payne & looseness or ache of the stomacke." It is to be feared that Pliny and others of these old writers do not rank high as medical authorities at the present day, yet the plant and fruit of the blackberry are still employed in various ways, with very gratifying results, in the treatment of disease.

According to legend, the origin of the disagreeably thorny character of the blackberry, as told by Waterton, was on this fashion: "The Cormorant was once a wool merchant. He entered into partnership with the Bramble and the Bat, and they freighted a large ship with wool; she was wrecked and the firm became bankrupt. Since that disaster the Bat skulks about till midnight to avoid his creditors, the Cormorant is forever diving into the deep to discover its foundered vessel, while the Bramble seizes hold of every passing sheep to make up its loss by stealing the wool."

Perhaps it would be casting discredit on the worthy ancestors who braved so many dangers in the settlement of our country, to

charge them with undue conservatism, yet it can hardly be doubted that men who would brave the uncertainties, not to say terrors, of an ocean voyage on an almost unknown sea, and the settlement of a new country peopled with savages of unknown traits and tendencies, rather than surrender ideas which they cherished, would not be quick to form new ones. Hence we can readily conclude that the blackberry of America was to them much what the blackberry of England had been—simply a wild bramble, to be destroyed when possible and replaced by something better, and whose fruit was to be gathered at will. Moreover, to cultivate a fruit which was so readily obtained in abundance for the gathering, would have been folly to them, when many other things conducive to their safety and comfort were so much more needed. As time went on, however, this gratuitous feast of nature, provided for the fostering of "infant industries," began to diminish, and the demand of growing cities for increased quantities of fruit doubtless led to the idea of cultivating the blackberry among the rest. Just when this state of affairs was reached it is impossible to say, but evidently not until quite late in our national development, for the blackberry does not seem to have begun to receive much notice or to be talked about in the horticultural journals until about 1850. From "Hovey's Magazine of Horticulture," it appears that Capt. Josiah Lovett, of Beverly, Mass., figured prominently in introducing it to cultivation. Even then, as with many other good and useful things, first impressions were unfavorable. Of course, the first effort would naturally be to bring plants, which bore the most promising fruit, from the woods and clearings and set them in the garden. This attempt to tame the wild protégé of the forest did not often prove satisfactory. These plants evidently did not take kindly to the refinements of civilization, and longed for their free and easy life of the wood. Capt. Lovett reports repeated failures in trying to get good berries by this method. He persevered for five years, but at last gave up in despair about 1840, and surrendered this wild gypsy of the fruits to its native haunts as untamable. In spite of these discouraging results he evidently did not abandon the dream of a cultivated blackberry, for Downing gives him the credit of having introduced the Dorchester, which in time proved so valuable, although according to Marshall P. Wilder,

as reported in the "Transactions of the Massachusetts Horticultural Society" for 1883, p. 129, it was brought to notice by Eliphalet Thayer, who first exhibited it before that society, August 7, 1841.

But these first introductions to cultivation, the Dorchester and Lawton, were not calculated to bring swift and lasting popularity to the blackberry as a garden fruit, for although large and attractive, their habit of turning black before they are ripe nearly always led to their being gathered and eaten while green, and their consequent condemnation as sour and poor in quality. Moreover, their culture, being little understood, led to frequent failures and unsatisfactory results, while their propensity to persist and spread, aided by their unmerciful thorns, conspired to render them a terror to many timid gardeners. In spite of all this, the blackberry has steadily pushed its way into prominence, until it is to-day one of our most satisfactory and profitable crops. Here, as with all other fruits, we are far from attaining perfection. We have no ideal variety. If we demand the best in point of hardiness, we must yield in size and quality; if delicacy of flavor is the desideratum, something else will be deficient. Yet to stand by a well-grown row of Early Cluster, for example, to see its glistening sprays of glossy black hanging in such graceful profusion, to gather its magnificent berries and to test their sweet and melting quality, just like those finest and ripest ones we used now and then to chance upon in some wooded nook which everybody else had missed, is to forget for the time being that anything further is to be desired in a blackberry. Still we have reason to hope that the achievements of this energetic and vigorous pomological youth are but an omen of what is yet to come.

THE DEWBERRIES

The dewberries are distinguished from the blackberries chiefly by their trailing habit of growth, their early ripening, the character of the flower-cluster, and the method of propagation. The true dewberries bear but few flowers in each cluster, the clusters are cymose, the center flower

opening first, and the flowers are few and scattered, generally borne on long and ascending pedicels, or stems, which tend to raise both flowers and fruit well toward the end of the shoot. In the blackberries the opposite of these characters is found. The clusters are corymbose or racemose, the outer flowers generally opening first, and the flowers are borne in rather dense clusters, the pedicels being shorter, as a rule, and standing more nearly at right angles to the main stem of the cluster. The dewberries propagate by means of tips, while the blackberries propagate by suckers, a point of much practical importance, in cultivation. Even this important point of distinction is not absolute. The common varieties of blackberries will occasionally root at the tips, as I have personally seen. Despite these characters, forms are found, both wild and in cultivation, so intermediate in character as to make them very difficult to classify. These intermediate forms are of special interest, and illustrate in a remarkable way the possibilities of admixture in the genus. Many of them are very productive, in apparent defiance of the pronouncements of science, which are that hybrids should be deficient in fruitfulness.

The most important type in cultivation is that represented by the northern dewberry. In this group four species are now recognized by Bailey (Cyclopedia of Horticulture). First is the one long known as *Rubus canadensis,* later thought to be the *R. villosus* of Aiton but now given the name *R. procumbens,* Muhl. This is the prevailing type of the northeastern states, except along the coast, reaching southward to Virginia. It is a running plant with canes usually bearing stout, recurved prickles,

the leaflets narrowed at the base and nearly or quite glabrous, the flowers being borne in the upper axils.

Rubus invisus, Brit., occurs in the same region as the above species, but its canes are less prickly, strong, terete and somewhat ascending, often making mounds of growth; the leaflets are large and the inflorescence dichotomous. *R. Baileyanus*, Brit., is more slender, not much prickly, with leaflets that are mostly broad at the base and pubescent beneath, the leaves or bracts in the flower-clusters being simple. This is the form described by Torrey and Gray as *R. villosus var. humifusus*. *R. Enslenii*, Tratt, occurs from Nantucket and Long Island southward on the Coastal Plain. This is a soft-caned, weak plant, bearing small, loose berries and has probably not entered into the make-up of the cultivated varieties.

The southern dewberry, *R. trivialis*, Michx., Fig. 24, is a variable type, chiefly distinguished from the northern forms by having the long, prostrate canes armed with stout prickles, which are sometimes dark purple in color; reddish bristles also occur at times. The leaves are firm, smooth, and practically evergreen, usually bearing stout prickles on the petioles and midribs. The flowers are usually borne on simple, more or less prickly peduncles. The fruit is sometimes excellent but often dry and seedy. This is the common dewberry of the southern states, ranging from Virginia to Florida and Texas, often becoming a pest in old fields.

The California dewberry, *R. vitifolius*, Cham. & Schlecht., Fig. 25, is the western representative of the wild dewberry family. It is a variable and perplexing species. The canes are long and trailing, or sometimes partially

Fig. 24. *Rubus trivialis* (×$^{2}/_{3}$).

Fig. 25. *Rubus vitifolius* (×⅔).

erect, with slender prickles. Leaves partially evergreen, leaflets broad, coarsely toothed, light green and pubescent above and beneath, other parts being more or less densely covered with straight bristles and glandular-tipped hairs. The fruit is black, oblong, sweet, with pubescent drupelets.

Some forms are perfect flowered; in others the bloom is staminate with abortive pistils and still others are pistillate, with only rudimentary stamens.

Just how far this wild type has entered into the cultivated berries of the Pacific Slope seems to be undetermined. Two or three varieties known to belong to it have been introduced but have not become prominent. The Loganberry, Mammoth, and Phenomenal have been supposed to have sprung from this species through hybridization, but their botanical origin is still a matter of doubt, some botanists believing that they represent a distinct species not yet well known in the wild state.

The position of the dewberry as a cultivated fruit is discussed elsewhere and need not be here considered. Exclusive of the loganberry and other Pacific Coast types it has not attained a prominent place in American pomology.

CULTIVATED VARIETIES OF BLACKBERRIES AND DEWBERRIES

The following list includes the names of blackberries and dewberries known to have been introduced into cultivation in the United States. Those more properly known as dewberries are followed by the letter (D). Those known to be of the hybrid blackberry-dewberry type by the letter (H). To draw sharp dividing lines is difficult and no exact classification is attempted.

Adair Claret.—Originated with D. S. Adair, Hawesville, Ky. Plant not quite hardy. Fruit medium size, claret color, soft, with a mild, pleasant flavor.—Downing.

Agawam.—Found growing wild in a pasture about 1865 or 1870, by John Perkins, of Ipswich, Mass. Plant hardy, vigorous, and productive. Fruit oblong, of medium size, large, black, sweet, and melting. A popular variety.

Albion.—Found and introduced by John B. Orange, of Albion, Ill. Fruit large, oblong, clear pink, sweet and good.

Alger.—Originated at Cleveland, Ohio. Of good size, oblong in form. Of a deep claret color; sweet and rich.

Allen.—Sent out for trial about 1894, by W. B. K. Johnson, Allentown, Pa. Said to be early and productive. Fruit glossy, jet black, not fading; flesh firm, but juicy; quality good.

Ambrosia.—Offered by A. L. and H. J. Bradley, of Makanda, Ill., as an extra-early variety, said to begin ripening with the red raspberries. Claimed to be exceptionally hardy, productive. Fruit large, jet black, not turning red when picked, firm and of high quality.

Americus.—Received at the office of the United States Pomologist in 1894, from J. H. Langille, Kensington, Md., and described in the report for that year. Thought to be a seedling of the Early Harvest. Stout, with flowers in rather short, erect, downy spikes. Fruit irregular, jet black, moderately firm, melting, juicy and of good quality, ripening soon after Early Harvest.

Ancient Briton.—The origin of this variety has been greatly in doubt. According to one report it was named by Robert Hassell, of Alderly, Wisconsin, who received it from England. Another report credits it with being a Wisconsin seedling, found by one A. H. Briton, for whom it was named, the name later becoming changed to Ancient Briton. The plant belongs to an American species and has proved one of the most valuable sorts grown in Wisconsin, being the favorite at the famous Thayer Fruit-Farm at Sparta. Plants sturdy, hardy and productive. Fruit long, melting, of fine flavor. One of the best varieties where it succeeds.

Aughinbaugh (D).—One of the best known varieties of the Western dewberry, of especial interest as being the supposed parent of the Loganberry. It was propagated and sold by a man named Aughinbaugh, about 1875. The blossoms are pistillate, hence it should be planted with other varieties to furnish pollen. The fruit is said to

be of excellent quality, but the plant is a weak grower and unproductive.

Bagnard.—Said to be as hardy as Snyder and far superior in quality. Considered one of the best by S. D. Willard of Geneva, N. Y., at one time.

Bangor.—A variety of Maine origin, first propagated from plants growing on the farm of Henry W. Brown, in Newbury.

Banton (Seedling).—A variety, said to be from Vermont, which proved very hardy in Minnesota.—Minn. Hort. Soc. Rept., 1874 : 57.

Barnard.—Said to be a seedling of the wild blackberries of Belmont county, Ohio, taken to Allamakee county, Iowa, and disseminated by Mr. Barnard. A popular variety in northern Illinois and Iowa, where it has proved very hardy.

Bartel (D).—This was the first named variety of dewberry. It was brought to notice sometime in the 70's by Dr. Bartel, of Huey, Clinton county, Ill. The plants are said to have appeared in an old cornfield on his farm, and the large size of the fruit led him to offer them for sale. The fruit is described as large, rich and juicy.

Bauer (D).—A variety sent out from Bauer's nursery, Judsonia, Ark. Said to be vigorous, with fine fruit, but unproductive. Probably *R. trivialis.*

Black Chief.—On trial at the Geneva (N. Y.) Experiment Station. Received from J. H. Haynes, Delphi, Ind.

Black Diamond (D) (Star, Wonder, Ewing's Wonder, Atlantic).—Said to have originated with George H. Liepe, from seed of the old Evergreen. Similar to the Himalaya in habit of growth, trailing the first year but more upright later, the canes living from year to year at the base; propagating by tips. Leaves green till late in autumn, free from rust. Fruit jet black, firm, about the size of Snyder, ripening very late, said to be borne in clusters something like grapes.

Blowers.—Said to have been found by a woman in the Chautauqua Grape Belt of New York. Plant upright, hardy except in the extreme north. Rust-resistant and exceedingly productive. Begins ripening in July and continues for a long time. Fruit large, jet black, a good shipper and of fine quality.

Bonanza.—Said to be similar to Kittatinny, but hardier.

Boston High-Bush.—Mentioned. Rept. Calif. Hort. Soc. 1886, p. 234. Dorchester may be meant.

Brandenburg.—Mentioned in Hovey's Magazine, 1868, p. 286.

Brunton Early.—An early variety which originated in Illinois. Similar to Early Harvest in habit of growth. Apparently deficient in pollen production, or self-sterile, and unproductive when planted alone. Of little value.

Cape May.—"Fruit large, black, sweet."—Downing.

Carlo.—Grown at the Geneva (N. Y.) Experiment Station. Unpromising.

Cherry Valley.—Originated near Cherry Valley, Ill.—Ill. Hort. Soc. Rept. 1882 : 284.

Clark.—Mentioned in The Rural New-Yorker for 1897, p. 598, as received from Matthew Crawford the spring previous.

Colonel Wilder.—Introduced by John B. Orange, and named in honor of Marshall P. Wilder. Of a bright cream color, large size, oblong, almost pointed, of superior flavor and quality. Mr. Orange regarded this as the most valuable of his white varieties.—Hov. Mag. 1864 : 360.

Crystal White (Orange's Crystal).—Originated and introduced by John B. Orange. Upright, with strong, green spines, lacking in hardiness, and suckering freely. Fruit large, roundish oval, clear, rich white when fully ripe, sweet, of good flavor and ripening early.

Cumberland.—Formerly known about Bridgeton, N. J.—Fuller.

Cutter Mulberry.—Introduced by G. B. Cutter, Newton, Mass., about 1859. Fruit long, slender, sweet.—Hov. Mag. 1859 : 397.

Dallas.—A Texas variety, found hardy, vigorous, productive and reliable there, but of little value in the North.

Dehring.—An early variety, about equal to Brunton in hardiness and productiveness; fruit small.

Doctor Warder.—Originated and introduced by John B. Orange. Color dark ruddy red, quality good.

Dodge Thornless.—Mentioned. Agr. of Mass., 1868–9, p. 72.

Dorchester (Improved High Bush).—A seedling introduced by Eliphalet Thayer, of Dorchester, Mass., who first exhibited it before the Massachusetts Horticultural Society, August 7, 1841. It was largely brought to public notice by Capt. Josiah Lovett, of Beverly,

Mass. Capt. Lovett had previously made unsuccessful attempts to transplant the best of the wild bushes to his garden, but after obtaining this variety, turned his best attention to it. Samuel Downer, of Dorchester, Mass., also seems to have been connected with its introduction. This variety is of special interest as being the advance guard of all the blackberries now in cultivation, since it was the first cultivated variety. It is a very upright grower, vigorous, and viciously thorny. Fruit large, oblong, conic, deep, shining black, nearly as large as Lawton, longer, with rather smaller drupelets.

Duncan Falls.—Introduced by J. C. Neff, Duncan's Falls, Ohio. Upright, vigorous; fruit large, black.—Downing.

Early Cluster.—The original plant of this variety was discovered about 1872, among Missouri Mammoth, on the farm of Charles W. Starn, in Southern New Jersey, where it attracted attention from its early and profuse bearing, and was transplanted and propagated for market. It is a moderate, erect, healthy grower, hardy and extremely productive. The fruit is medium sized, short-oblong, shining black, sweet and of fine quality, without hard or bitter core. The entire crop ripens within a few days, making it a desirable early market berry. Yet the variety never became popular. Either spurious stock was sent out or it thrives only in special localities. I have never seen a more satisfactory blackberry, nor tasted one of finer quality, than the Early Cluster as I have known it.

Early Harvest.—An early variety, found growing wild in Illinois. Moderately vigorous, upright, often tender. Canes greenish, with comparatively few thorns. Fruit small, roundish to oblong, greenish black, soft, juicy, mild and pleasant. Very early.

Egypt.—Mentioned. Proc. N. J. Hort. Soc. 1900 : 192.

Eldorado.—Originated as an accidental seedling in Preble Co., Ohio, near a village of that name, and first placed under cultivation about 1882. Hardy and free from attacks of orange rust. Fruit large, glossy black, holding its color well, juicy and of excellent flavor. A popular variety both for the home-garden and for market in many localities.

Colossal (D).—A sort offered by L. L. May & Co., St. Paul, Minn.

Erie (Uncle Tom).—Found on lands of L. B. Pierce, of Tallmage, Ohio, in 1876. Probably a seedling of the Lawton. The variety was

sold to Matthew Crawford, in 1884, he in turn selling it to J. T. Lovett, who offered it for sale in 1886. Mr. Lovett first announced it under the name of Uncle Tom, but later the name Erie was substituted, which is the only one under which it was offered for sale. A strong, spreading grower, very thorny, productive, but lacking in hardiness in some regions. Season intermediate. Fruit large, roundish oval, of good quality.

Eureka (H).—In 1876 William Parry selected the best and most perfect berries of Wilson's Early, grown by the side of Dorchester, planted them, grew the seedlings together for four years, then selected the best, which was named Eureka, the others being destroyed.—Mich. Hort. Soc. Rept. 1886 : 407.

Excelsior.—Productive, of fair quality, good size, season medium; lacks hardiness.—Mass. Hatch Exp. Sta. Bull. 6 : 4.

Fairfax (D).—Sent out by C. A. Uber, of Fairfax county, Virginia, who found it wild on a stony, unproductive hillside in that county.

Farley.—Origin unknown. Fruit nearly as large as New Rochelle, sweet, and earlier.—Horticulturist.

Felton.—Introduced by Oscar Felton, Camden, N. J. Rather spreading; fruit large, long, sweet and good.—Fuller.

Ford No. 1.—On trial at the Geneva (N. Y.) Experiment Station.

Freed.—A variety originated about 1871 by George Freed, of Columbiana Co., Ohio. Rank and hardy, but a shy bearer.

French Lawton.—A selected and improved strain of the Lawton offered by W. N. Scarff of Ohio.

Fruitland.—A variety from Ohio. Canes strong, upright, grooved, with greenish red bark. Fruit medium, nearly round, with medium large grains, sweet, good.

Gainor.—Large and productive, but not hardy enough at Ottawa, Canada.—Rept. Can. Exp. Farms, 1889 : 95.

Gardena (D).—Name from Gardena, California. Thought to be a seedling of Premo. Very early, being the first to ripen and coming on very fast. Large, jet black and firm. Plant healthy, resisting frost well. Successful in Southern California.

Geer (D).—A variety discovered by F. L. Wright, in a wood-lot belonging to a Mrs. Geer, of Plainfield, Livingston Co., Michigan.

It was first brought under cultivation in 1887. Said to be productive, though small in fruit.

General Grant (D).—Introduced by Charles A. Green, of Rochester, N. Y., in 1885 or 1886. It came from M. W. Broyles, somewhere in Tennessee. It possessed little value.

Golden Queen (D).—Mentioned as a new dewberry of golden yellow color, large and productive. Hort. Gleaner, 1898 : 100.

Grape.—Mentioned as a variety with strong canes and large fruit. Am. Pom. Soc. Rept. 1860 : 76.

Guadalupe (D).—Found wild by Otto Locke of New Braunfels, Texas. Vigorous, productive, early, large, long, sweet and showy.

Haley.—A dwarf variety, found in Franklin Co., Kansas. Brought under cultivation by E. Haley, about 1880.

Haupt (H).—Thought to be a blackberry-dewberry cross. Very thorny. Must be cross-pollinated. Rural New-Yorker, 1914 : 252.

Hess.—Mentioned. Mich. Expt. Sta. Bull. 206 : 59.

Himalaya-Berry.—A very rank growing plant, woody at the base and partially perennial in mild climates. Successfully grown on the Pacific Coast but valueless in the East, where it lacks hardiness, blooms late and does not pollinate itself, producing imperfect berries.

Himinan.—Mentioned. Proc. N. J. Hort. Soc. 1900 : 192.

Hoag.—Originated many years ago with Charles R. Hoag, one of the original members of the Minnesota Horticultural Society, who then lived at Kasson, Dodge Co., Minn. The variety was named for him by the society.

Holcomb.—First brought to public notice at one of the weekly exhibitions of the Hartford Co. (Conn.) Horticultural Society, in the summer of 1855, by E. A. Holcomb, of Granby, Conn. Fruit of fine appearance and good flavor, ripening early.

Honey Coreless.—Offered by Bradley Brothers of Illinois as productive, hardy and a rampant grower, requiring staking or close pruning. Fruit large, jet black, coreless and delicious; ripening with Early Harvest.

Hoosac Thornless.—Found in the Hoosac Mountains of Massachusetts. Its chief recommendation is the absence of thorns. Fruit not large, but said to be productive and of good quality.

Humboldt (D).—A writer in The Rural New-Yorker for 1896,

p. 574, mentions this as having been selected from the wild blackberry of California, and describes it as a rampant grower and abundant bearer, ripening with Hansell raspberry, a month before the Early Harvest blackberry. Fruit jet black, one and one-half inches long by one inch thick, in selected specimens. Flavor "marvelous, delightfully spicy, with a wild-wood aroma."

Iceberg.—Plant said to be strong and productive. Fruit creamy white, about the size of Snyder, sweet with few seeds. Blooms imperfect and need to be pollinated with some early blooming sort. Said to have been produced by three generations of crossing, Lawton being one of its grandparents.

Idaho (*Climbing*).—Mentioned in Hovey's Magazine, in 1868. It may have been the cut-leaved blackberry or a western dewberry.

Johnson.—A variety from Missouri, said to be adapted to the South, and popular there.

Jordan.—Introduced by J. W. Austin, Pilot Point, Texas. Fruit large, ripening ten days later than Dallas and Early Harvest.

Joy.—Originated with Jacob Miehl, in Atlantic County, New Jersey. Said to be unusually hardy, productive and ripening about midseason. Fruit large, coal black, nearly as thick as long, rich and luscious.

Kenoyer (H).—Said to be a cross between Kittatinny and Early Harvest, originating in Kansas. Canes strong, resembling Kittatinny in wood and leaf. Fruit large and luscious, ripening about with King. Said to do better than other varieties on thin clay soil. Said not to be fully self-fertile.

Kentucky White.—Introduced by D. S. Adair, Hawesville, Ky. Plant tender; fruit light dirty white, imperfect.—Downing.

King (Early King).—Plant rather small, erect, stiff, with several small canes from each stool, making a thick clump; spines large. Berry of medium size, oval, irregular, of best quality; core soft, ripe as soon as black. A week earlier than Snyder. Too soft for market. Desirable as a large, early berry.

Kittatinny.—Found in the town of Hope, N. J., near the base of the Kittatinny Mountains, and introduced by E. Williams about 1865. Plant fairly hardy and productive. Fruit large to very large, roundish conical, rich glossy black, moderately firm, juicy, sweet,

and well flavored, ripening early and continuing long in bearing. Very susceptible to attacks of red rust.

Knox.—Plants strong, upright, about as hardy as Kittatinny; fruit large, attractive and of good quality.

La Grange.—Offered by Bradley Brothers of Ill., as a Russian product, said to have been brought from that country and fruited for some years by Mr. La Grange of Illinois. Reputed to be extremely hardy and very productive, possessing more or less everbearing habits, the first fruit ripening in July and continuing until September. Fruit said to be large and free from core.

Latimer Seedling (D).—Mentioned as on trial at the Geneva (N. Y.) Experiment Station. Received from J. W. Latimer, Pleasanton, Kansas.

Lawton (New Rochelle, Seacor's Mammoth).—Found by Lewis A. Seacor, in New Rochelle, N. Y., and brought to public notice largely by William Lawton, of the same place, about 1848. Vigorous, hardy and productive, with strong spines. Fruit very large, oval, and intensely black when fully ripe. It is then juicy, soft, and sweet, with an excellent flavor, but when gathered too early, very sour and insipid. This was the second blackberry introduced into cultivation, and it did much to popularize the fruit.

Leader.—Originated with Daniel S. Kriebel, in Kenakee Co., Illinois. Said by him to be large, of the best quality, and very productive, never failing to produce a crop.

Lincoln.—A wild plant found about two miles from President Lincoln's monument, near Springfield, Ill. Vigorous, upright, hardy, with long spines. Fruit large, glossy, of good quality.

Loganberry (D).—This berry originated on the grounds of Judge J. H. Logan, of Santa Cruz, California, in 1882, from seed planted by him the preceding year. A full account of its origin, as given by Judge Logan himself, appears in Bulletin 45 of the Rhode Island Experiment Station. It seems that he had for some time been interested in raspberries and blackberries, and had growing together the Texas Early blackberry, the Aughinbaugh dewberry, and an old but unknown variety of red raspberry, resembling the Red Antwerp. In August of 1881 he planted seeds of the Aughinbaugh, expecting to get a cross between it and the Texas Early. He raised

Plate VI. The loganberry.—The fruit about one-half natural size; loading crates for the car, in Oregon.

about fifty seedlings. One of these, the Loganberry, was very similar in every respect to the parent, but much larger and a stronger grower. At the time the seed was sown Judge Logan did not think it possible to cross the Aughinbaugh with the raspberry, but the characters developed by this seedling led him to think it to be a hybrid between them. Judge Logan states that out of thousands of plants grown from seeds of this variety, not one has ever shown, so far as he is aware, any of the distinct characteristics of either parent, not one has gone back to the original type of either the raspberry or the Aughinbaugh, though most of them are inferior to the original plant. He also states that he has never succeeded in crossing the Loganberry with either of its parents, nor with seedling crosses between the Aughinbaugh and the Texas blackberry.

In the characters of the plant, and in the shape and conformation of the fruit the variety is essentially like the Aughinbaugh, propagating entirely by tips, though by artificial methods they may be grown from hard-wood cuttings. The core remains with the fruit, like the blackberry, its principal resemblance to the raspberry being in color and flavor, although the dewberry dominates in flavor. Judge Logan says: "As to the fact of the plant being a hybrid between the blackberry and the raspberry, of course there is no absolute proof. The color, with the distinct raspberry flavor of the fruit, and the circumstances under which it originated, I think render the fact of such a cross almost certain." The fruit of the loganberry is illustrated in Plate VI.

The other plants in this lot of seedlings Judge Logan thinks to have been crosses between the Aughinbaugh and the Texas, as he expected, though they resemble the Aughinbaugh in most of their characteristics.

The hybrid origin of the loganberry has always been open to question, as recognized by Judge Logan himself. Recent observations reported in "The Journal of Heredity" for November, 1916, indicate that the type is not the result of a cross as has been commonly supposed. W. O. Backhouse, Economic Botanist to the Argentine Government, reports many seedlings grown by himself and others which do not behave as seedlings of hybrids may be expected to behave. This is in harmony with Judge Logan's ex-

perience. Such seedlings appear to be remarkably constant, while hybrids between the loganberry and other species of Rubus show the characteristics common among hybrids of well-defined species.

In the same article, C. I. Lewis of the Oregon Experiment Station is quoted as saying that wild plants of the loganberry type are occasionally found in Oregon, California and Washington. It is said to be so common on Vancouver Island that a nurseryman located there reports being in the habit of going to the woods and digging wild plants to fill orders whenever his stock became depleted. These observations indicate that the plant represents a specific type of dewberry and that the plant which appeared on Judge Logan's grounds may have come from some other source than the seed which he sowed. Bailey, who has been over the subject from the point of view of botanical characteristics, states in the "Standard Cyclopedia of Horticulture," 1916, that it is "said to be a hybrid," "but the botanical origin of it is by no means clear."

The loganberry has now become a prominent fruit in parts of California and the Pacific Northwest, but does not succeed in the East. It is so easily excited into growth and blooms so early that it is nearly always injured by winter-killing or by spring frosts in the eastern states. (See Plates V and VI.)

Lovett.—Described as hardy, vigorous and productive. Fruit large, mostly globular, drupes large, quite firm, though juicy.

Lucretia (D).—Probably the best known of all the dewberries. Found by a soldier in the Civil War, who, being stationed near Beverly, W. Va., during most of his service, returned there after the war in search of a wife, and acquired this dewberry as a perquisite to the plantation owned by her. He transplanted some to his garden, and later sent plants to his father in Ohio. These fell into the hands of B. F. Albaugh, of Covington, Ohio, who named the variety and introduced it to the trade. As sent out, the variety was greatly mixed, but the true type is a large fruit, productive, of good quality, and gives satisfaction wherever the dewberry succeeds.

Lucretia's Sister (D).—Introduced by J. B. Treedway, of Brandt, Ohio, about 1886. Seems to possess little value.

Luther.—Sent out by R. D. Luther, Fredonia, N. Y. Said to be vigorous, hardy and promising.

Mammoth.—This is one of the seedlings grown by Judge J. H. Logan, and thought by him to be a cross between the western dewberry, *Rubus vitifolius*, and the Texas blackberry. It appears to be similar to the loganberry in type and habit of growth, propagating by tips like other dewberries. Apparently it is similar to the loganberry except in color. The berries are black, very large, often reaching two inches or more in length and very sour. It is not hardy in the eastern states but is grown extensively in the Pacific Northwest. The canes are peculiar, being covered with small, short spines. They start very early in the season, growing thick and stout until about five feet high, then begin to trail, growing 25 to 30 feet in the season, rooting at the tips in autumn. The leaves are partially evergreen in California.

Mammoth (D).—Two varieties of the eastern dewberry appear to have been sold under this name. Cornell Univ. Exp. Sta. Bull. 34 : 306.

Mammoth (Thompson's Early Mammoth) (H).—Said to be like Wilson in size and general habit of growth, but a few days earlier.

Manatee (D).—Introduced by Reasoner Brothers, Oneco, Fla., in 1889, as a selected strain of *Rubus trivialis*. Productive in that state, ripening its fruit in April, and being a good shipper. Also said to succeed in California.

Mason Mountain.—Introduced by R. O. Thompson, of Nebraska, about 1865. Fruit large, resembling Lawton.

Maxwell.—Introduced by A. C. Maxwell, Chanute, Kansas. Described as large, sweet, rich and melting. Lacks vigor, hardiness and productiveness in some localities.

Mayes (Mayes Hybrid, Austin's Improved) (D).—Found growing wild in Texas, on the farm of John Mayes, some time about 1880. Mr. Mayes began cultivating the variety, and found it to improve under cultivation. Later it was sent out by J. W. Austin, of Pilot Point, Texas, as Austin's Improved. The plant is trailing in habit when young, but is said to become stronger and somewhat upright with age. It propagates by tips or root-cuttings. The fruit is very large, of fine appearance, and the plants are prolific.

Maynard (H).—A variety found growing on the farm of C. C. Maynard, at Kincaid, Kans., between the Lucretia dewberry and the Early Harvest blackberry, and sent out for trial by him as the Maynard dewberry. Berry round, composed of a few very large, jet black drupelets, ripening with the blackberries; many berries in a cluster.

McCracken.—Found in an Illinois wood by Mr. McCracken.

McDonald (H).—A variety of the hybrid type, trailing the first year but sending up stronger canes afterward. Prized for its earliness, ripening with the dewberries, ahead of Early Harvest. Fruit of good quality, resembling the dewberry and somewhat larger than Early Harvest. Should be planted with some other variety to insure pollination. Mayes dewberry is recommended for this purpose.

Mersereau.—Originated with J. M. Mersereau, Cayuga, N. Y. Plant vigorous, upright, resistant to disease and very hardy. Fruit large, brilliant black, retaining their color well when picked, sweet, rich and melting, ripening with Snyder. Considered one of the dependable varieties for home or market.

Minnewaski.—Originated and introduced by A. J. Caywood, of Marlboro, N. Y. A good grower, erect, branching, strong. Canes grooved, and thickly covered with long, straight spines. Hardy and productive. Fruit clusters large; fruit very large, long, dull in color, and somewhat hairy in appearance, of fair quality.

Missouri Mammoth.—Disseminated from Northern Missouri.

Mountain Rose.—Mentioned. Kan. Hort. Soc. Rept. 1886, p. 297.

Nanticoke.—A strong grower, productive, rust-resistant and hardy. Fruit large, juicy, rich and sweet. Said to be a fine table berry but not firm enough to stand long hauls. Very late. Introduced in 1912.

Needham White.—Introduced to notice by J. Shed Needham, of Massachusetts, sometime about 1850. Described as of lilac color. Canes light green and thickly covered with short, stiff, green hairs.

Nevada.—Said to be quite productive, of fair size and excellent quality.

Never Fail.—Thought to have originated in central Ohio. One grower says that "it never fails to produce an abundance of wood, but always fails to produce fruit. I never had a perfect berry."

Newman Thornless (H).—Discovered by Joseph Newman, Ulster

county, New York. Canes of moderate growth, and thornless. Fruit rather large, oval, of very good flavor. According to one grower, it produces few thorns and fewer berries.

Ohmer.—A seedling found by N. Ohmer, of Ohio. Hardy, healthy and productive. Fruit large, late, firm, no core, and sweet before it becomes soft. Ripens with Taylor.

Ozark.—"Better than either Snyder or Taylor, and more productive."—Mo. Hort. Soc. Rept. 1883 : 79.

Parish Pink.—Of no more value than other white varieties.

Parker Early.—Mentioned in Hovey's Magazine, 1868, p. 286.

Parnell.—A variety originated by Mr. Normand, of Marshville, Louisiana. La. Exp. Sta. Bull. 3, 2d series.

Peruvian (Blackberry).—A variety of the common European blackberry. Growth rank and dense; canes very long and large. Fruit small, sweet, lacking in character.

Phenomenal (Berry).—Produced by Luther Burbank and claimed to be a cross between the California dewberry and Cuthbert. Similar to the loganberry but thought to be superior in some respects.

Piasa.—Sent out by E. A. Riehl, Alton, Ill.

Piasasaw.—Mention. Proc. N. J. Hort. Soc. 1900 : 192.

Premo (D).—An early variety found in a patch of Lucretia. Much like Lucretia but seven to ten days earlier. Quality and size uniform. Bloom imperfect; should be planted with Lucretia or Austin.

Primus (D).—A variety produced by Luther Burbank, of Santa Rosa, California, and said by him to be a cross between *Rubus vitifolius* and *R. cratægifolius.* The plant is said to be a strong grower and productive, partially trailing, thickly covered with short, blunt prickles, propagating by tips, though with some difficulty. Fruit large, long, sweet, resembling the raspberry in flavor, adhering to the core and ripening with the Hansell raspberry. Hard to pick and too soft for market. A colored plate, together with a description, appears in the report of the United States Pomologist for 1892.

Purple-Fruited.—A blackberry reported from Orwell, Ohio, with ripe fruit purple instead of black.—Meehan's Monthly, 1895 : 185.

Rathbun (H).—Sent out by A. F. Rathbun of Smith's Mills, N. Y. Thought to be a cross between the Wilson blackberry and a dewberry, having the trailing habit of the dewberries the first year,

rooting at the tips and producing suckers but sparingly. Hardy and productive. Fruit large, firm, glossy jet black, with small seeds, good flavor and soft core. Ripens about with Wilson.

Red Hybrid.—Mentioned in "Experiments and Public Work of the Colorado Agr. College," 1884, p. 15.

Reyner.—Canes strong, vigorous, greenish, with few prickles. Fruit short, irregular, with large drupelets, sweet and of good quality but small.

Robinson.—Originated by Willard R. Cisco, of Texas. Described as vigorous, upright, prolific, large and of good quality. Reported good in Texas but a shy bearer in the North, being unable to stand a temperature much below zero.

Rodgers (D).—Offered as the earliest variety in Texas. Large, of excellent quality and a good shipper.

Role Early.—Mentioned. Rept. Kan. Hort. Soc. 1887–8, p. 482.

Sable Queen.—Introduced by J. W. Manning, Reading, Mass. Said to equal Dorchester or New Rochelle in size, beauty and fruitfulness.—Downing.

Sadie.—Sent out from Iowa under the claim that its cells were so arranged as to resist very low temperatures.

Sanford.—Very productive but too small to be of value. Fruit resembles Snyder.

Seedless Blackberry.—Not seedless, but the seeds are small. A good family berry in California. R. N. Y. 1908 : 234.

See Early.—So much like Brunton's Early that it may be the same. Ill. Hort. Soc. 1878 : 125.

Simpson.—Mentioned. Proc. N. J. Hort. Soc. 1900 : 192.

Sinclair.—Mentioned in Hovey's Magazine, 1868, p. 285.

Skagit Chief (D).—A variety sent out from the state of Washington in 1891. Supposed to be *R. vitifolius.*

Snyder.—This is the best known of all blackberries. What the Baldwin is to the apple in the eastern states and the Ben Davis in the West; what the Concord is to the grape; what the Lombard is to the plum, the Snyder is to the blackberry. It originated as a chance seedling, on or near the farm of Henry Snyder, near La Porte, Ind., about the year 1851. It is a vigorous, strong, upright grower; very hardy and productive. Fruit of poor quality, medium size,

Plate VII. Blackberry.—The Snyder, about five-eighths natural size.

nearly globular, of good appearance and a good shipper. The berries tend to turn red after picking, if exposed to sunlight. (Plate VII.)

Sorsby.—A Texas variety. R. N. Y. 1914 : 765.

Stayman (Early).—Introduced by A. J. Stayman, Leavenworth, Kansas. Early, of excellent quality and productive. It has not proved valuable in the eastern states.

Sterling Thornless (H).—A chance seedling, found on the farm of John F. Sterling, Benton Harbor, Mich., in a field where Wilson and Lawton had been growing. The canes resemble those of Wilson in size, shape, and color, but are comparatively thornless. The fruit is borne in cymose clusters, with long pedicels, like the dewberries. Size medium, oblong, with large, rather loosely set, round drupes.

Stone (Hardy).—An Illinois variety of spreading habit, with fruit mostly hidden beneath the foliage. Hardy, maturing its wood early on suitable soils. Fruit rather small, roundish, black, soft, very juicy, mild, and pleasant.

Success.—Very productive, plants moderately vigorous, canes of a greenish color, grooved, bearing abundant prickles. Berries medium to large, roundish, of good flavor.

Taylor (Taylor's Prolific).—Introduced by Mr. Taylor, of Spiceland, Henry Co., Indiana, about 1867. It has peculiar greenish-yellow, round canes, somewhat slender and trailing in young plants. Very hardy, vigorous and productive. Fruit large, roundish-oblong or thimble shaped, soft in texture, juicy, very mild and rich. It ripens late, about two weeks after Snyder. This is one of the best and most dependable varieties I have known.

Tecumseh.—A variety of the Taylor type which originated in Western Ontario.

Texas (Early) (Crandall, Crandall's Early).—Said to be large, fine flavored and firm, ripening two weeks earlier than Lawton. Grown in California, but has not proved valuable in the East.

Texas Hybrid (Texas Pink Hybrid).—Of medium size, delicate pink color, sweet and nearly free from seed.

Topsy (Childs's Tree Blackberry).—Canes stout, upright and viciously thorny, but not hardy; fruit large, late, soft, of good, but not high quality. Of no real value in cultivation.

Truman Thornless.—Received at the office of the United States

Pomologist in 1892, from G. P. Peffer, Pewaukee, Wisconsin, and mentioned in the report of that year. Said to be nearly thornless, as hardy as Snyder, earlier and better.

Wachusett.—Found growing wild on Monadnock Mountain, in Massachusetts. A shy bearer of little practical value, but of historical interest.

Wallace.—Introduced by Wallace of Wayne Co., Indiana, about 1862. Stocky, upright, with broad round leaves resembling Snyder; hardy, vigorous and productive. Fruit large and of excellent quality. A valuable mid-season variety.

Wapsie.—An Iowa variety, mentioned as on trial and proving very hardy thus far.—Rept. Ohio Hort. Soc. 1888 : 192.

Ward.—Largely grown in New Jersey, where it was found growing wild. Thought to be a seedling of Kittatinny, which it much resembles. Plant hardy, vigorous, productive and much more rust-resistant than its parent. Fruit large, black throughout, without a hard core, sweet and of excellent quality.

Warren.—Fairly hardy and quite productive. Berry about like Snyder in quality and size.

Washington.—Raised by Prof. C. G. Page, Washington, D. C. Fruit large, black, sweet and good.—Downing. Mentioned as new in Hovey's Magazine, in 1859.

Washington Belle.—Sent out from the state of Washington with the Skagit Chief. Both varieties appear to have the imperfect blossoms so common in the western dewberry.

Watt.—Found growing in an orchard near Lawrence, Kansas, some years ago. A strong grower, productive, hardy and resistant to disease. Begins ripening early and extends late into the season. Fruit large, roundish, glossy black and of good quality.

Western Triumph.—Found upon the open prairie, in Lake county, Illinois, in 1858, by Mr. Biddle, of Muskegon. Fruit of medium size. Lacking in hardiness, and inclined to overbear.

Weston.—Originated with Adrian Durkes, of Weston, Mo., who considered it more productive than Newman or Lawton.

White Dewberry (D).—White dewberries appear to be well known in Texas. One is mentioned in the Gardener's Monthly for 1877, p. 174, as being known among the horticulturists of that state.

What is very likely the same thing was received from Colorado county, of that state, and introduced by Samuel Wilson, of Pennsylvania, in 1890, under the name Mammoth White, or Wilson's White. The natural inference is that the Albino White of Parry and the Crystal White of Childs belong to the same type.

Wilson (Wilson's Early) (H).—This variety was discovered by John Wilson, of Burlington, N. J., about 1854. The bush partakes of the habit of both the low and the high blackberry, some of the shoots being erect and branching, others slender, and trailing on the ground, indicating a hybrid origin. The trailing shoots sometimes take root at the tips. The fruit is very large, firm, somewhat irregular, tapering toward the apex; grains mostly large, but with some small ones mixed in. Long a popular variety in New Jersey. It demands close pruning to prevent overbearing, and must be covered for winter protection in most localities.

Wilson Junior (H).—William Parry, in 1870, selected plants of Dorchester and Wilson and planted them together, far away from any others, trusting that the pollen of one kind might mix with the other. In 1875 he selected some of the best Wilson varieties for seed. After watching the other seedlings for four years, the largest and best was selected, and this is Wilson Junior.—Gar. Month. 27 : 208. The plant is so like its parent, the Wilson, as to be indistinguishable from it.

Windom (Cook's Hardy) (D).—Brought to notice in 1887 by the Seedling Commission of the Minnesota State Horticultural Society. It was discovered and brought into cultivation by Dewain Cook, of that state, who found it to be hardy, productive, of fair size, and good flavor.

Woodland.—Plants thrifty, productive, with abundant small prickles. Fruit medium, with large grains; flavor and quality good.

Recommended varieties of blackberries and dewberries.—Snyder long held the lead as a commercial blackberry and even yet stands well to the front. Its hardiness, productiveness, bright color and good shipping qualities have been in its favor. Its quality is poor, and it ought to be

replaced by better varieties wherever possible. Taylor is a better berry and nearly or quite as dependable, possibly not quite so attractive in appearance. Other varieties which are in high repute in certain localities are Ancient Briton, Eldorado, Erie, Mersereau and Ward.

Among dewberries, Lucretia appears to lead in the East, Mayes in the Middle West and Southwest, while the loganberry and Mammoth seem to be the great berries of the Pacific slope.

CHAPTER IX

INSECTS AFFECTING THE BRAMBLES

The insects which attack brambles are many and various, some serious, others but chance or general feeders. Taken as a whole these fruits are less subject to injury than many others, though at times considerable damage may occur from the depredations of some of their enemies.

In this discussion no exhaustive treatment of any of them will be attempted. The more important facts concerning their life-history, together with the most feasible methods of combating them, are given in condensed form, for the use of the busy man who may need to meet them and do it promptly, with little time for investigation or study. Slingerland and Crosby's "Manual of Fruit Insects," to which the reader is referred for a more complete discussion of many of them, is drawn on largely for present knowledge and recent methods of control.

THE TREE-CRICKET

Œcanthus nigricornis, Walker

The work done by this insect was, until recently, attributed to another species, the snowy tree-cricket, which is now found to limit its work chiefly to apple and other fruit-trees. The insect is a delicate, greenish-white, long-horned cricket, with broad and transparent wing-covers, through which the folded wings can be seen. These wing-covers are crossed by oblique thickenings or ribs, which

form part of the musical apparatus of the insect. Its chirp is a familiar sound at night during late summer and autumn.

The insect is beneficial, in the main, rather than injurious, since the young crickets, which hatch in May and June, feed principally on aphids and other soft-bodied insects. The only injury worthy of mention is that caused by the female in depositing her eggs in autumn. Their location is shown by a narrow, ragged wound, some two inches long. If the cane is split open there will be found inserted in the pith a row of oblong, cylindrical, yellowish eggs, about one-eighth of an inch in length. These punctures may either kill the upper part of the cane or weaken it to such an extent as to prevent the fruit from ripening.

Remedy.—Since the eggs are laid in autumn, but do not hatch until the following summer, cutting out and burning the wounded parts at the annual pruning is the only remedy necessary.

Reference.

Parrott, Jour. Ec. Ent. 4:216.

THE BRAMBLE FLEA-LOUSE OR BLACKBERRY PSYLLID

Trioza tripunctata, Fitch

This insect is a jumping plant-louse, closely related to the pear psylla. It occurs in the Atlantic states from Maine to Virginia. Its native food is the wild blackberry and it has long been known as an enemy of the cultivated blackberry. The following description and life-history are taken from Slingerland and Crosby's Manual of Fruit Insects.

"The adult insect is about one sixth inch in length; the body is yellowish-brown, the eyes dark brown, and the wings marked by three yellowish-brown bands. The insect hibernates as an adult. The flies appear on the blackberry soon after growth starts in the spring and deposit their minute, light yellow eggs in the pubescence of the leaf petioles and young canes. On Long Island adults, eggs and newly hatched nymphs were observed the latter part of June. Both adults and nymphs puncture the leaves and tender canes with their piercing mouth-parts and feed on the juices of the plant, causing the leaves to curl, also dwarfing and distorting the young canes.

The minute young nymphs are whitish or greenish white in color; the older nymphs are yellowish. They mature in early fall and the adults go into hibernation."

The effect on the plant was well described by Charles Parry, a horticulturist of New Jersey, as long ago as 1869. He says:

"The suckers upon which this insect occurs in the spring commence to twirl around, and, when not interfered with, make a complete revolution before they resume their usual course. The leaves curl up, and become matted around the curl, so as to make a safe harbor for the lice-like larvæ, which during the summer appear on the under surface of the leaves."

Fig. 26. Blackberry "mistletoe," work of the bramble flea-louse.

Owing to the peculiar distorted appearance of infested plants the injury has sometimes been mistaken for a fungous disease. In some localities it is known under the name of "mistletoe." (Fig. 26.)

Methods of control.—Thorough work in cutting out and destroying the infected parts is the means of control most generally advised. It has also been suggested that methods similar to those used against the pear psylla might prove effective. Tobacco extract and kerosene emulsion are the favorite remedies for this purpose. Little definite knowledge seems to be available.

Reference.

Geneva, N. Y., Expt. Sta. Rept. 14:619 (1895).

THE BUD-MOTH

Tmetocera ocellana, Schiffermuller

The bud-moth is primarily an apple insect but often attacks blackberry plants, as well as other fruits. It spends the winter as a half-grown, dark brown, black-headed caterpillar, in a little silken retreat near the buds. As soon as the buds begin to open in spring the caterpillars leave their winter quarters and begin feeding on the tender buds. They tie the expanding leaves and flowers together with silken threads, drawing in more leaves and flowers as needed. The partly eaten leaves soon turn brown, thus rendering the work conspicuous.

The larva lives most of the time within a tube formed by rolling the edge of the leaf down, fastening it, and sparsely lining the interior with silk. It comes forth from this tube to feed, but quickly retreats into it again when disturbed. Pupation occurs in a cocoon formed in a similar manner. The moths, which in New York appear in the latter part of June, fly mostly at night, remaining quiet on the trunk and limbs of trees during the day, and are so similar to the bark in color as not to be easily seen.

The eggs are generally laid singly on the under surface of the leaves, and are so nearly transparent that they closely resemble fish scales or minute drops of water. They hatch in from seven to ten days, and these summer larvæ soon make themselves a tube of silk mingled with bits of excrement. They feed on the epidermis and inner tissue of the leaf, not eating through it, and spin a protecting web over their entire feeding ground. After the third moult, when they have attained a length of about 4 millimeters, they leave their tubes, and make for themselves a little silken cell in some crevice or roughness of the bark, where they pass the winter, in readiness for the opening buds the following spring. Their injuries at that time are particularly exasperating, because they apparently destroy as many leaves and flowers as possible by eating only a part of each. There is normally but one brood in northern latitudes, though since the larvæ hibernate when half-grown, two different generations appear during the same season.

Remedies.—Spraying with arsenical poisons just as the buds open, or gathering and destroying the brown "nests" which are formed by the dead leaves soon after the insect begins its work, appear to be the most feasible means of attack. Several parasites, some birds, and a large predacious wasp, prey upon this insect and help to hold it in check.

Reference.

Cornell Univ. Expt. Sta. Bulls. 50 and 107.

THE BRAMBLE CROWN-BORER (FIG. 27)

Bembecia marginata, Harris

This insect is a near relative of the peach-borer, being so similar in all its transformations that it has at times been mistaken for that insect by growers. The adult insects are clear-winged moths, appearing much like wasps or hornets, for which they may be readily mistaken when seen in the open field. The body of the insect is rather more than half an inch in length, black and prettily banded with golden yellow, with a tuft of yellow hair near the base of the abdomen. The wings are narrow, transparent, with a bronze or reddish brown margin, the front wings having also a narrow cross-band toward the tip. They measure about an inch across when expanded.

Fig. 27. Crown-borer. *Bembecia marginata.*

The moths emerge during August and early September and the eggs are deposited on the under side of the leaves near the edge. The young caterpillar crawls down the cane and goes into winter quarters in some protected place, usually just underneath the surface of the ground. In spring it enters the roots or the base of the cane, generally burrowing just underneath the bark and girdling that part of the plant. The second winter they hibernate in their burrows, being then one-half to three-fourths inches long. In spring they work upward, then outward to near the surface before changing to the pupa stage.

Destroying the larva by digging it out or removing and burning

the wilting or dying tips which show its presence are the only practicable methods of control known.

References.

N. J. Expt. Sta. Spec. Bull. N. (1891).

Wash. Expt. Sta. Bull. 63.

THE RASPBERRY CANE-MAGGOT

Phorbia rubivora, Coquillett

This is the larva of a true fly, grayish black in color, closely resembling the common house-fly, though not quite as large. The larva is a slender, white, footless maggot, found burrowing in the tips of raspberry canes. It is closely related to the radish and onion maggot. The eggs are laid early in spring, very soon after the young canes start, in the fork at the base of the tip leaves. The young larva burrows into the cane near the point of hatching, works its way downward in the pith a short distance, then proceeds to girdle the cane inside the bark. The part above the girdle soon wilts, turns to a dark blue color and dies. The effect is usually to kill the entire shoot also. The larva continues to bore downward in the dead or dying cane, transforms to a pupa near the base, and there remains until the following spring, when it emerges as the adult fly.

Although often a serious pest, the insect may readily be overcome. If the wilting tips are gathered and burned as soon as noticed, which will usually be during May, the work of those larvæ will be forever ended.

References.

Cornell Univ. Expt. Sta. Bull. 126:54.

Wash. Expt. Sta. Bull. 62.

THE AMERICAN RASPBERRY BEETLE (FIG. 28)

Byturus unicolor, Say

This insect is doubly troublesome, because injurious, or at least annoying, both in the perfect and in the larval state. The mature insect is a small beetle about three-twentieths of an inch long, of a yellowish brown or pale reddish color, and densely covered with fine, pale yellow hairs. In this form it is injurious to raspberries and

blackberries, first by attacking the opening buds and tender leaves, then by eating into the flower buds and destroying the sexual organs. A hole in the side of the bud will show where the beetle has entered. When the injury is complete, the buds usually wither and fail to open; if only partial, the flower may expand, but only to develop an imperfect, worthless berry. It also attacks the open flowers, partially hiding at the base of the stamens. It works chiefly in the morning and evening, seldom being seen in the middle of the day.

Fig. 28. *Byturus unicolor.*

Its offspring appears as a small, soft, tarnished white worm, remaining on the fruit of the red raspberry when it is gathered. It is usually found within the cup or cavity of the berry, and is difficult to detect.

When full grown, the larva drops to the ground, often with the berry, no doubt, hides under any convenient rubbish, forms a little cell in the earth, and changes to a hairy pupa of a pale, dull yellowish color. Here it remains during the winter, transforming to the perfect beetle about the middle or latter part of May, and emerging in time to carry on its destructive work in the blossom buds.

Remedies.—Thorough spraying with arsenate of lead at the rate of three to four pounds to 50 gallons of water, at the time when the beetles first appear, has been found effective at the Ohio Experiment Station. Shallow cultivation in the fall has been suggested as a means of destroying the pupae.

References.

Fitch, Trans. N. Y. State Agr. Soc., 1870, p. 358.
Felt, Rept. N. Y. State Ent. 15:158 (1898).
Ohio Agr. Expt. Sta. Bull. 202.

THE RED-NECKED CANE-BORER (FIG. 29)

RED-NECKED AGRILUS GOUTY-GALL BEETLE

Agrilus ruficollis, Fabr.

In winter and spring the canes of raspberries and blackberries often show one or more comparatively small and regular swellings, an inch or more in length, the outer portions being roughened with brownish slits and ridges. They are rarely more than one-third

thicker than the normal cane, and are caused by the work of a small borer, which is very similar in appearance and which belongs to the same family as the flatheaded apple-tree borer. It is described as about one-third of an inch long, with black wing-covers having a dull bluish reflection. The thorax or neck has a reddish or coppery appearance and the head is black with metallic reflections. They may be found from late May until August, being most abundant in June. The egg is laid near the base of a leaf on the young growth. The galls are usually confined to the main canes, and may be near the base, or two or three feet above ground, though sometimes even the more vigorous laterals are attacked. The injured canes may put forth leaves and blossoms, but the fruit seldom ripens, and the cane dies before the end of the season.

Fig. 29. *Agrilus ruficollis*, the red-necked cane-borer and its work.

The larvæ burrow in a spiral direction, confining themselves, in the early stages of their existence, wholly to the sap wood, and by this means girdle and kill the cane. According to one observer, this habit of girdling the cane in order to kill it the first season seems to contribute to the safety of the larvæ, which otherwise freeze and perish, perhaps owing to the greater quantity of sap which surrounds them in living canes. They are said to be more frequently destroyed in this manner in blackberries than in raspberries. Like the crown-borer, it often escapes detection by reason of the belief that the injury is due to winter-killing.

The larva reaches its full size toward the latter part of April, bores into the middle of the cane, where it will be more secure from insect foes, forms a smooth, oval cell, and transforms into a white pupa, showing quite plainly the marks of the future beetle. It gradually darkens, and assumes more and more the form of the perfect insect.

Control.—As the perfect insect does not emerge from the cane till late in spring, it is only necessary to attend to the spring pruning promptly, taking care to watch for and remove all galls. All wood cut away should be carefully collected and burned, for removing it from the root in no way hinders the development of the beetles. Although black raspberries are attacked, no galls are formed and little or no injury is done, the insect apparently confining its work to the center of the cane. This may make its destruction more difficult, since its presence cannot be easily detected. Wild bushes growing in the vicinity are also a menace by serving as breeding-grounds. The insect is reported more destructive in the southern than in the northern states.

References.

N. J. Expt. Sta. Spec. Bull. N.
W. Va. Expt. Sta. Bull. 15.
Ohio Expt. Sta. Bull. 45.

THE ROSE CHAFER (FIG. 30)

Macrodactylus subspinosus, Fabr.

In sandy regions, where it is prevalent, this is one of the most dreaded enemies of the horticulturist. It appears in such vast hordes oftentimes, and is so difficult to poison, that it is very hard to combat. In July the female beetle lays about thirty whitish, nearly globular eggs about one-thirtieth of an inch in diameter, which are placed three to six inches beneath the surface of the ground. The eggs hatch in about twenty days, and the young larvæ feed on the roots of grasses and other plants until the approach of cold weather, when they work their way deeper into the ground, passing the winter in a torpid state. In spring they approach the surface and form an oval cell of earth in which to pupate, and from which

they emerge in great numbers, all at once, a habit common to other beetles of the class to which they belong. This occurs about the time that grapes are in blossom. The favorite food of the mature beetle consists of flowers, especially those of the rose, grape, spirea, sumach, magnolia, etc.; but the foliage of nearly all plants also suffers. In one report of their ravages in New Jersey, Professor Smith says: "Of the small fruits, the blackberries seemed very attractive. They were on each blossom, and ate the petals but left the green forming fruit. Last year they ate the leaves as well, and left only the canes. This year they left the leaves. Raspberries were totally destroyed."

Fig. 30. Rose chafer.

Although occurring throughout the greater portion of the northern half of the United States east of the Rocky Mountains, it appears to be more or less local in its habits, for in parts of central New York and northern Pennsylvania it is seldom or never seen. In the Gulf states and the extreme southwest the species is replaced by other closely allied ones. These, though very similar in appearance are usually less destructive.

Remedies.—Many remedies have been tried against this insect, but usually with very unsatisfactory results. Ordinary spraying has afforded little relief. The insects either avoid the poison or are affected so slowly that little benefit results. Recently it has been found that sweetening arsenate of lead with molasses or glucose gives much better results. Four pounds of the lead arsenate and one gallon of molasses to fifty gallons of water are the proportions recommended. It should be applied as soon as the beetles appear and repeated if necessary. Thorough cultivation of the soil when the insect is in the pupa stage, during late May and early June, is thought to destroy many of them. Waste grass lands which afford breeding-grounds for the pest are objectionable in the vicinity.

References.

N. J. Expt. Sta. Bull. 82.
Geneva, N. Y., Expt. Sta. Bull. 331.
U. S. Bur. Ent. Circ. 11 and Bull. 97.
Hartzell, Jour. Ec. Ent. IV, 19.

THE RASPBERRY CANE-BORER (FIG. 31)

Oberea bimaculata, Olivier

The larva of this species is a footless grub, similar to the round-headed apple-tree borer in form, found boring in both blackberry and raspberry canes. It is best known as a raspberry insect, but in Bulletin 23 of the Cornell University Experiment Station, from which the following quotations are taken, an instance is recorded of serious injury to blackberries. In this case the boring larvæ were found only in the bearing canes, while in raspberries they attack the young shoots.

"The mature insect is a long-horned, slender-bodied beetle about half an inch in length. It is of a deep black color, except the segment next the head, the prothorax, which is yellow. There are usually two or three black spots on the upper part of this segment, but frequently these are wanting.

Fig. 31. Cane-borer. *Oberea bimaculata.*

"The eggs are laid in the early summer, usually during the month of June. They were not observed in the blackberry; but when the insect infests raspberries, the first indication of the injury noticed is usually the withering and drooping of the ends of the young shoots. If these be examined, there will be found at the base of the wilted portion two rows of punctures encircling the cane about half an inch apart, and between them a small hole in which an egg has been deposited. This double girdling of the cane is done by the beetle with her jaws at the time she lays her egg. It has been suggested that the purpose served by this girdling is the arresting of the circulation of the sap in this part of the cane; and in this way the prevention of the crushing of the tender egg by a vigorous and rapid growth of the tip of the cane." The larvæ bore downward in the pith of the cane, probably reaching the root in autumn, where they transform and pass the winter. "The burrows are about one-eighth of an inch in diameter; they wind from side to side of the pith, and at frequent intervals penetrate the woody part of the cane. In some of the cases where the woody part of the cane is penetrated, an opening is made through the bark. These openings occur at in-

tervals of a few inches throughout the length of the tunneled portion of the canes; they are small, being about one-third of the diameter of the burrow; and their object is to enable the larva to deposit its excrement outside of the burrow."

Remedies.—"The methods of combating this insect are simple, but they require prompt attention. As soon as the tips of the canes begin to droop they should be cut off below the point where they are girdled. In this way the larva can be destroyed before it has begun to bore into the lower portion of the cane, and thus only the tip of the cane will be lost. When, however, the first indication of the presence of this pest is the dying of the entire cane, caused by the boring of the larva, the infested canes should be promptly cut out and burned. These canes can be readily recognized by the dying of the leaves and by the small holes in them described above. They are most likely to be observed at the time of the blackberry harvest. It is of the utmost importance that the cutting and burning of these canes should be done promptly. For if it be delayed till autumn, the larvæ will have penetrated the roots and will then be beyond the reach of the pruning shears."

References.

Cornell Univ. Expt. Sta. Bull. 23.

Ohio Expt. Sta. Bull. 96.

THE STRAWBERRY WEEVIL (FIG. 32)

Anthonomus signatus, Say

Although this insect is primarily known as a strawberry pest, where its injury is most common and most serious, it breeds in the buds of wild blackberries and dewberries and some other plants. At times, when abundant, it does material damage to cultivated blackberries. It is a small curculio or snout-beetle, about one-tenth of an inch long, with black head and convex shining wing-covers varying in color from black to reddish brown, but with a large black spot on each.

Fig. 32. Weevil. *Anthonomus signatus.*

The insects hibernate in the beetle stage, under rubbish, especially in woodlots and hedge-rows. In spring they appear and begin feeding on immature pollen, then deposit their eggs in the unopened buds

of strawberries, blackberries, and the like. The eggs are laid inside of unopened buds in which plenty of pollen will be found for the young larvæ to feed upon. After laying the egg the female crawls down the stem of the bud and girdles it so that it either falls at once or after hanging by a few shreds for a short time. The larvæ develop upon the pollen and inner parts of this fallen bud, then pupate within it. The beetles feed for a short time after emerging upon pollen, especially that of wild bergamot, then go into winter quarters in midsummer, there being but one generation a year.

Control.—Fortunately, the work of this insect comes in cycles, being serious for two or three years then disappearing. Little seems to be known in regard to definite means of control. With strawberries, planting largely imperfect varieties which are less subject to attack, by reason of not supplying pollen for the insect to feed upon, may help. With the blackberry, clean cultivation, to destroy the hibernating quarters of the beetles, is perhaps the most feasible means of attack.

References.

Chittenden, Ins. Life, 5:167 and 7:14.

N. J. Expt. Sta. Bull. 225.

THE RASPBERRY SAW-FLY

Monophadnus rubi, Harris

This insect is a black, thick-bodied, four-winged fly about one-fourth inch in length, the female having a yellowish-white band across the abdomen. The flies appear in May and the eggs are placed between the two layers of the leaf near a vein. The leaf dries at the point where the egg is laid, giving it a spotted appearance. The larvæ feed upon the leaf tissues, eating out irregular holes and even all but the larger veins. The full-grown larvæ are about three-fourths of an inch long, light green in color and covered with transverse rows of spine-bearing tubercles. When full grown they leave the bush, enter the ground and make for themselves a little oval earthy cocoon mixed with silky and glutinous matter, from which the flies emerge the following spring.

Control.—In well-cultivated fields brushing the larvæ from the plants in the middle of the day so that they fall upon the hot

ground will destroy them. Arsenical sprays are effective, but owing to the danger of poisoning the fruit, hellebore, one ounce to a gallon of water, is to be preferred.

Reference.

Geneva, N. Y., Expt. Sta. Bull. 150.

THE RED-SPIDER

Tetranychus bimaculatus, Harvey

This is a minute mite, about one-fiftieth of an inch long, varying in color from pale greenish-yellow to dark crimson-red, with two dark spots at the side of the body. It is a well-known greenhouse pest and sometimes also attacks plants in the open. It thrives best in a hot, dry atmosphere, hence is most prevalent in times of heat and drought.

Red-spiders usually work on the under side of leaves under a delicate silken web. The young mites are lighter in color than the adults and have only six legs instead of eight. They continue to breed while conditions are favorable, then hibernate in the ground or underneath rubbish until spring.

Remedies.—Dusting the under side of the leaves with finely powdered sulfur, or spraying with a mixture of it at the rate of one pound to three gallons of water with a little soap added, has been found effective. Sulfur is difficult to keep in suspension. To help in this it is recommended to dissolve a small amount of glue in water to be used in first making a paste of the sulfur. Even then constant stirring will be necessary.

Plain flour paste has been used in California with good results. Care is taken to make the paste smooth, without lumps, diluting to one gallon of water for each pound of flour. It is then cooked, stirring constantly and adding water to offset evaporation. For use, four gallons of the stock solution are added to fifty gallons of water. This too has a tendency to settle and must be kept well agitated while spraying.

References.

Maine Expt. Sta. Rept., 1892:133.

Col. Expt. Sta. Bull. 152.

U. S. Bur. Ent. Circ. 166.

THE BLACKBERRY LEAF-MINER

Metallus rubi, Forbes

Though ordinarily considered of minor importance, this insect may at times cause considerable damage. The adult is a nearly black saw-fly about one-sixth of an inch in length. The larvæ feed between the two layers of the leaf like other leaf-miners, making rather large, irregular, blotched mines. Sometimes several of these mines may be found on a single leaf. These injured parts turn brown and die. The flies appear and begin laying their eggs in May and June. The larva is greenish white, with brownish markings, and is about one-third of an inch long when full grown. The larvæ enter the ground an inch or so to transform, and in warmer localities there are two broods a year.

Treatment.—A mixture of one-half pint of "Black Leaf 40" tobacco extract, two pounds of soap and fifty gallons of water, which has been found effective against an elm leaf-miner, has been suggested as a possible remedy of value.

THE RASPBERRY WEBWORM

Pamphilius Fletcheri, MacGillivray

This insect has been reported troublesome in New Brunswick. It is a bright green worm, half an inch long when full grown, being the larva of a small sawfly. They web together the terminal leaves, feeding within. Handpicking, or dusting with hellebore before the webs are formed are suggested.

Reference.

Fletcher, Rept. Ent. Bot. 1899, p. 180.

THE RASPBERRY HORNTAIL

Hartigia abdominalis, Cresson

This is another cane-girdler, which has caused trouble in California, attacking young shoots of raspberry, blackberry, loganberry and rose. The adult is a slender, yellow and black four-winged horntail fly about five-eighths of an inch in length. It is found on the plants

from April to August. The eggs are inserted just under the bark of the young tender tips of the young canes. The larva works downward, several times around the cane, thus girdling it. It then burrows upward until the tip dies, after which it works downward through the pith toward the base of the cane. When fully grown the larva is nearly an inch long and nearly white. It pupates at the end of the burrow and the adult gnaws its way out. Crushing the egg, the presence of which is shown by the discolored tissue, or cutting off and burning the dying tips, seem to be the most feasible means of controlling it.

Reference.

Monthly Bull. State Com. of Hort. Cal. I, No. 12 (1912).

THE LESS PROMINENT INSECTS

The preceding list aims to include all species which are injurious enough to possess real economic importance, but no strict dividing line can be drawn. Special conditions may at times favor the development of a particular insect to such an extent that it may become a serious pest for a short time, while ordinarily of little importance. Much depends upon conditions and environment.

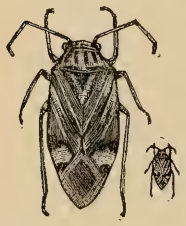

Fig. 33. Tarnished plant-bug. *Lygus pratensis.*

Many others are known to attack bramble plants, some of which are general feeders and some of which from their very nature can never do serious damage. Among those which may at times give concern are the ones mentioned below.

The tarnished plant-bug, Lygus pratensis, Linn. (Fig. 33), sometimes attacks the young fruits of blackberries and perhaps raspberries, causing them to develop imperfectly. No very satisfactory method of control seems to be available.

The raspberry geometer, Synchlora glaucaria, Guen., is a small caterpillar which feeds on the leaves and especially the fruit of the raspberry and blackberry. Its presence in the fruit is the more annoying because it disguises itself by fastening to the thorny prickles of its body bits of dried berry, seed, pollen, leaves or other debris,

making it difficult to detect. No practical remedy seems to be available.

The giant root-borer, Prionus laticollis, Dru. (Fig. 34), is a very large beetle, two or three inches long, which works in the roots of blackberries, and other plants. Its presence in the blackberry is indicated by the sudden dying of one or more canes in a hill. The insect is not common and can be controlled by digging up and destroying the plants when the injury first appears.

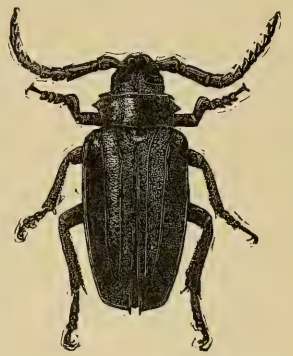

Fig. 34. Giant Root-borer. *Prionus laticollis.*

The raspberry leaf-roller, Exartema permundanum, Clemens, sometimes attacks the leaves of raspberries and blackberries, webbing them together in May and June. The larva is dark green with a pitchy-black head and thoracic shield. Although generally distributed in the eastern states it seldom does serious damage. Hand-picking or early spraying with arsenites will control it if treatment becomes necessary.

The negro-bug, Corimelæna pulicaria, Germar, causes trouble by its presence in ripe fruit of berries of all kinds. It is a small, shiny black bug about one-eighth of an inch long, with a white stripe on each side of the body. It gives a disagreeable "bed-bug aroma" to the fruit. No feasible means of control is known.

Several scale insects may become prevalent on brambles at times. Perhaps the commonest is the rose scale, others being the oyster-shell and scurfy scales and the European fruit lecanium.

Other enemies are leaf-rollers, the red-humped apple caterpillar, climbing cutworms, the apple leaf-hopper, flea-beetles, clover-mite, strawberry root-worms, and other insects.

CHAPTER X

DISEASES OF THE BRAMBLES

Bramble plants are subject to attacks from some serious diseases. So injurious are they at times, and so hard to control, that the cultivation of one and another of these fruits has been driven out of certain localities by their ravages. Positive remedies are not easily found. From their nature and habit the plants do not lend themselves to treatment as well as many other kinds of fruits. Sprays often do not adhere well, and during much of the time when they may be needed are unsafe because of the presence of the fruit upon the bushes. In some cases more definite knowledge concerning the life-history and habits of the pest may be needed. It often happens that careful methods of growing and training, with frequent renewal of plantations, are the most feasible means to employ. In some cases such methods are effective, in others they are not.

The present discussion can hope to add nothing to what is already known. Its aim is to present in brief form what is known that may be of help to the busy grower in his fight with these enemies should he meet them.

RED RUST

Cœoma interstitiale, Schlecht.

This disease was first described by Schlechtendal in 1820 under the name given above. Since then its names have been many and

varied, the one in most common use being *Cæoma nitens*. Its relationship to *Puccinia Peckiana* was supposed to be established independently in Germany and in the United States some years ago. Other more recent studies throw doubt upon this relationship and suggest that it may belong to an entirely different genus. All this is of interest to the botanist but does not concern the berry-grower.

The appearance of this disease is well known, both on wild and cultivated plants. The orange-red color of the under surface of the infested leaves is due to the abundance of sori, which produce the spores by means of which the disease may be spread from plant to plant. These are connected in chains, and form a waxy layer over the affected portions. The mycelium of the fungus, which corresponds to the roots of higher plants, is perennial, living throughout the winter in the canes and roots. A plant once attacked is therefore doomed. Its vitality is sapped, and its condition is soon manifest by the numerous small, weak canes which spring up.

Treatment.—Diseased plants should be rooted up and burned as soon as discovered, to prevent the spore formation and consequent spread of the disease. This, if promptly done, is a practical remedy. Spraying can only help to prevent new infection. If employed against the anthracnose, it will also be of use against red rust spores, if they exist.

Reference.

Clinton, Ill., Expt. Sta. Bull. 29:273.

ANTHRACNOSE

Glæosporium Venetum, Speg.

This disease is probably the most serious fungus, and perhaps the most serious enemy, of raspberries and blackberries now known. It is reported to have driven the growing of black-caps out of the region west of Buffalo, New York, and is becoming abundant on Columbian, the leading purple-cane variety. It is also a serious pest in the Pacific Coast region. The fungus was first described by an Italian botanist, M. Spegazzini, from leaves of the northern cloudberry, *Rubus Chamæmorus*. It was first mentioned in the United

States in the Agricultural Review for November, 1882, by T. J. Burrill, who referred to it as the raspberry cane-rust.

The gray, discolored spots caused by this fungus are well known to all berry-growers. They are found on all parts of the plant, but on the leaf are not easily distinguished from those of some other fungi. They often become so numerous that they destroy a large part of the living cane and greatly weaken or even kill it. The disease seems to be especially injurious just at ripening time. On red raspberries its presence sometimes incites a warty growth like that shown at Fig. 35. This growth itself may be due to the work of other organisms, especially crown gall bacteria.

Fig. 35. Anthracnose inciting knotty growth on red raspberry.

According to Washburn anthracnose behaves differently on different varieties in the Northwest, which appears to be true elsewhere. He says that it is chiefly confined to the leaves and stems of Cuthbert, while only the leaves of Himalaya Giant are attacked. On the stems of Snyder blackberry the spots reach three or four times the size of a pinhead, are sunken and often split when mature. They extend nearly through the bark, run together, and form irregular patches which may partially girdle the cane. On the leaves the spots are only half the size of a pinhead, round, white in the center and reddish-brown on the margins. They often run together and the dead patches drop out. But it is on the fruit that he finds the fungus most injurious. It attacks the drupelets at the end and usually at the end of the berry. Several drupelets in a cluster generally suffer. This may happen at any stage of growth but usually when the fruit is still green. Few or many drupelets may be affected, sometimes all at once, sometimes spreading from one to another. The infected spot stops growing and turns a dull reddish-brown. If attacked early it dries, if late it becomes soft and easily crushed. The drupelets may partially mature but the berry is deformed and unsalable. Lucretia dewberry

is badly injured but only the stems and leaves are said to be attacked.

The mycelium, creeping between the plant cells, causes their destruction and the consequent appearance of the dead spots. Only the bark and cambium layer of the stems are affected as a rule, the mycelium rarely entering the wood to any extent. Near the center of the spots the mycelium threads unite to form a dense tuft, made up of the slender club-shaped basidia on which the spores are borne. These basidia are formed beneath the surface, but soon rupture it and form a minute globule outside, being covered with a clear, gelatinous substance which holds the spores in place. When brought in contact with water, this substance readily dissolves and allows the spores to float away. These germinate readily in water, and many of them soon find lodgment in healthy portions of tissue and form new centers of infection. If the water which sets them free from the inclosing mass soon evaporates, they are readily distributed by the wind.

Treatment.—Experiments have shown that the spores germinate most readily in pure water. It has also been observed that the spread of the disease is more rapid in wet weather than in dry weather. For these reasons it is advisable to so set and train the plants that they shall have plenty of sunlight and air. Excessive pinching of the tips, causing the formation of a dense head, is to be avoided. Neglected plantations or others in which no pinching is practiced are sometimes free from the disease. Old wood should be removed and burned as soon as fruiting is over. The removal of diseased wood is seldom feasible, since all parts of the plant are likely to be attacked. This should be done in setting young plants, however, if it is impossible to get plants which are entirely free from the disease. Experiments in different states have shown that careful spraying will prove effective and in some cases profitable. Bordeaux mixture in the proportion of 4–4–50 is advised before the leaves appear, again when the shoots are six inches high and a third time just before the blossoms open. It should be remembered that the mycelium remains alive in the canes during winter, and that spraying can in no way cure the disease. It can only prevent, if thoroughly done, the germination of spores as they are produced. The

longer plants are allowed to remain the more troublesome is the disease likely to become. It is usually better, therefore, where it is prevalent, to discard and remove plantations after three or four good crops have been secured.

References.

Geneva, N. Y., Expt. Sta. Bull. 124:261.
Washington Expt. Sta. Bull. 97.
Burkholder, Phytopathology, 4: 407.

RASPBERRY CANE-BLIGHT

Leptosphæria coniothyrium, Sacc.

Raspberry cane-blight is a disease which has caused much loss among commercial raspberry-growers. Apparently it is widely distributed and is a serious enemy to combat. It attacks both red raspberries and black-caps, though blackberries are apparently exempt. It works chiefly on the fruiting canes, though young canes are occasionally seen to be affected. The leaves suddenly wilt and dry. Sometimes the whole cane may be affected, sometimes only a single branch, more frequently only some part. With black-caps the disease often starts from stubs left in pruning, gradually working downward from branch to branch, sometimes on one side of the cane only. Whenever the cane is encircled it dies. Sometimes there may be several points of attack on the same cane. The bark where attacked is usually lighter colored and smutty, with smoke-like patches of spores. Sometimes minute pimples, the spore-cases of the fungus, are visible. The diseased wood is much discolored and very brittle. Sometimes, when a large part of the cane becomes diseased before dying, the wood will crack and the bark peel off. Canes may begin dying soon after the leaves appear in spring, but the trouble increases as the season advances and becomes most serious at ripening time. Canes loaded with ripening fruit may suddenly wilt and dry up. The trouble does not seem to spread from a single point of infection but diseased canes may be found here and there all through a plantation. Thrifty plantations seem to suffer as much as neglected ones. Apparently only the canes

Plate VIII. Enemies. Center, Cane-blight of raspberry. Left, Cane-knot of blackberry. Right, cambium miner of red currant (*Opostega nonstringella*).—Courtesy of Geneva, N. Y., Experiment Station.

are affected, neither the roots nor the leaves being attacked. A diseased cane is shown at Plate VIII.

In many plantations the loss may not be very serious, yet at times it has taken one-fourth to one-half the crop. As a rule it is more destructive in older plantations, becoming more and more serious as the plants grow older. Yet the damage varies from season to season, and a plantation seriously affected one year may sometimes suffer less the next. Damp weather during the period of infection doubtless favors its spread, but later weather conditions probably have little influence. The fungus is supposed to gain entrance to the young canes during summer and autumn, perhaps also the following spring, when they have become fruiting canes.

Infection commonly takes place in wounds of various kinds. In black-caps it often starts where the young cane has been pinched back; also wherever branches have been removed, rubbed or split. The wounds of the tree-cricket are a common point of attack.

All varieties are affected but some more seriously than others. Cuthbert and Marlboro, two of the leading commercial red raspberries, seem to be particularly susceptible. Columbian, on the other hand, is comparatively exempt.

Methods of control.—No definite methods of fighting this trouble appear to be available. Spraying does not seem to have given results of much promise. The disease is readily carried in young plants, hence the first precaution is to secure healthy stock if possible. This, in turn, should be planted on uninfected soil, where raspberries have not been previously grown. Removing and burning the old canes as soon as fruiting is over is a wise precaution, since it is upon these old canes that the spores are being ripened. In setting young plants, as little of the old cane as possible should be left if there is reason to suspect that they carry any of the disease. This fungus is probably largely responsible for the fact that raspberry plantations must be so frequently renewed in order to produce profitable crops.

Reference.

Geneva, N. Y., Expt. Sta. Bull. 226.

SPUR-BLIGHT OF RED RASPBERRIES (FIG. 36)

Mycosphærella rubina, Jacz.

This disease appears in the form of brown or bluish-black spots on the young canes of red raspberries, in late summer or early autumn. The spots may be from one to four inches long and may extend partially or wholly around the cane. The boundaries are sharply defined but only the bark is affected, the cane itself being uninjured. The disease is common on red raspberries and is also found on Purple-Cane varieties, but not on black-caps. During winter the spots change to a light gray color and the boundaries become indistinct. In spring they are thickly studded with small black spore-cases, known as perithecia, but the wood is still uncolored and the cane apparently uninjured in growth. In this respect it differs decidedly from the cane-blight.

Fig. 36. Spur-blight of raspberry.

Recent investigations at the Colorado Station show that the disease may do considerable damage by killing the buds and thereby preventing the formation of branches on the lower portion of the cane. Hence the name spur-blight. It appears highly probable that the disease may be controlled by the use of bordeaux mixture, the first application being made when the new canes are a few inches high, a second one shortly before the blooming period and a third soon after the fruit is harvested; but it is doubtful if the damage done is sufficient to warrant the expense of spraying.

This trouble was formerly thought to be due to a bacterial disease and was figured as such in a previous edition of the present work.

Studies made at the Geneva, New York, Experiment Station have shown this to be a mistake.

References.

Geneva, N. Y., Expt. Sta. Bull. 226.

Colorado Expt. Sta. Bull. 206.

BLUE-STEM OF BLACK RASPBERRY

Acrostalagmus caulophagus, Lawrence

This is a disease which has proved very destructive on the Pacific Coast, especially in Washington. It first appears on the canes, which become discolored and dark, or rarely blue-black. It is most conspicuous toward the base and on the most vigorous plants. On the young shoots the blue-black color may spread over the entire shoot in the course of a few days. The leaves wilt and turn yellow, then brown. The fruit only partially develops and is dry, coarse and tasteless. The fungus may gradually work its way back into the roots, causing a reddish or brown discoloration of the wood. It is thought to live over winter in the soil and enter the plant at the crown, working upward. It has also been found on the roots of red raspberry and blackberry but is not common there. It is very destructive at times and may cause a loss of a considerable portion of the crop.

Little definite experimental work appears to have been done in trying to control it. Spraying, so far as tried, seemed to be of no value.

Reference.

Wash. Expt. Sta. Bull. 108.

LEAF-SPOTS

Several species of fungi attack the leaves of brambles, causing leaf-spots. Among the more common and best known are *Septoria Rubi*, West., with two botanical varieties and *Cylindrosporium Rubi*, Ell. and Morgan.

These two species differ in their botanical characters but are very similar in their general appearance on the leaves. Both cause small brown or light-colored spots, and when abundant may do harm

by the amount of leaf-tissue which is destroyed. Attempts to control the trouble by spraying seem thus far not to have given results of much promise.

LEAF-RUSTS

Two species of Phragmidium, one on blackberries, the other on raspberries, are prevalent and sometimes abundant, though seldom considered injurious. They are found on the under side of the leaves and would be difficult to combat. Blackberries are sometimes attacked also by late rust which, as its name implies, appears late in the season. It is caused by the fungus *Kuehneola uridinis* (Lk.) Arth.

DOUBLE-BLOSSOM (Fig. 37)

Fusarium Rubi, Winter

This disease is very destructive on certain varieties of dewberries and blackberries, from New Jersey southward along the coast, but especially in the Delaware-Maryland Peninsula. It is known to occur on several species of Rubus but is especially severe on Lucretia dewberry and Rathbun blackberry. It is reported to have been so destructive to Lucretia on the above peninsula as to drive one-half the growers out of the business. The life of a field of berries is often shortened two or more years by its ravages.

Fig. 37. Double-blossom.

The disease becomes noticeable when the leaf-buds open, the diseased buds usually being larger than normal ones. They are often accompanied by one or more small buds at the side. The diseased buds produce "witches' brooms" instead of normal shoots. These may consist of a mass of short slender twigs or of one good shoot, somewhat reduced, with several short deformed ones. Such diseased shoots often remain green after the old canes are dead. The blossoms usually have enlarged, thickened sepals and petals, and sometimes more than the usual number. The petals are generally wrinkled, giving the blossom the appearance of being double.

The disease generally appears about the second year of fruiting

and increases from year to year until the plantation becomes worthless. On old plants every bud is sometimes deformed. Unlike most plant diseases this one does not seem to vary in destructiveness in different seasons except as it steadily increases. The affected flower-buds either die or produce only worthless fruit.

The mycelium of the fungus is found within the diseased leaf-buds and is especially abundant within the flower-buds. Spores are produced within forty-eight hours after the flower-buds open. These spores are carried to the young buds of the current year's growth, germinate and produce mycelium which remains practically dormant within the bud during winter. Canes or parts of canes covered with grass are seldom affected. The mycelium develops rapidly in spring but does not penetrate the tissues of the plant and pass back into the stem, a fortunate fact.

Treatment.—Spraying has not proved effective against this disease. The fact that the spores are produced during the period of bloom and fruit-growth indicates that it will not be a feasible method of control. Since the fungus does not reach beyond the base of the bud it is possible to control it by hand-picking the diseased buds. This should be done as soon as the leaf-buds open. They can then be readily seen, but later are more difficult to find. Experiments in Delaware indicate that this is cheaper than spraying would be if effective. It has not been possible to entirely eradicate the disease, but it has been held in check. The yield has been better, the fruit of better quality and the life of the plantation prolonged from one to two years. Plants for setting should preferably be taken from young plantations, since the disease is less prevalent in new fields.

Reference.

Cook, Del. Expt. Sta. Bull. 93.

CROWN-GALL

Bacterium tumefaciens, Smith et al.

This disease is characterized by a rough knotty growth about the stem of plants at the surface of the ground, on the roots beneath, or on the canes or branches. The knots or galls, in their commonest form, have a rough or granular appearance, somewhat resembling, when young, the callous growth at the end of a cutting. When old

Fig. 38. Root-gall of raspberry.

they look something like the black knot in plums, but are seldom so dark in color. In Germany the disease is known as "Wurzelkropf." It has ruined thousands of trees in different parts of the United States and is one of the dreaded enemies of the nurseryman and orchardist. The cause of the malady was long in doubt, it having been attributed to eelworms, slime-moulds and other agencies at different times in the past. It is now believed to be a bacterial disease. It is found on daisy, poplar, rose, peach, apple, raspberry, blackberry, and many other plants. It is either due to the same or closely related organisms, as in the case of the legume bacteria. It is the same disease whether on the roots, stems, branches, or at the crown of the plant. The bacteria live within the cells of the plant. Galls are most readily produced in soft, growing tissue and especially wherever wounds or injuries occur. This doubtless led to the belief at one time common among nurserymen, that the swellings were simply due to injuries of different kinds. The disease has been very carefully studied by the Bureau of Plant Industry at Washington. Many cross inoculations were made, as from peach to raspberry, blackberry, and the like, and even from daisy to many other plants. The beginning of the gall could sometimes be detected as early as the fourth day after the inoculation was

made. The disease is even found on legumes, sometimes being mistaken for the nodules of nitrogen-gathering bacteria. A characteristic gall as found on raspberry roots is shown at Fig. 38. A knot on a blackberry cane may be seen in Plate VIII.

The galls sometimes afford lodgment for other parasites, such as fire-blight, root-rot, and the like. Overfed plants seem most subject to attack. The more vigorous a plant the larger the tumor, as a rule. Hairy-root of the apple is due to the same or to a very closely related bacterium.

A very peculiar and interesting fact in connection with this disease is that in its habit of growth and development and in the formation of connecting "stroma" it is very similar to the development of cancer in man. Apparently it may very properly be called a plant cancer, as suggested by those who have given it most careful study in recent years.

Treatment.—No cure is known for the trouble. The bacteria are out of reach, where no external treatment can affect them. Affected stock of all kinds should be scrupulously avoided; neither should healthy stock be planted on infected land. The disease is very prevalent among red raspberries and blackberries, the so-called cane-knot of the latter being apparently only one form of it. For this reason it may be unwise to plant these fruits among valuable young orchard trees. Rigorous nursery inspection in many of our states is now doing much to reduce the spread of this disease.

Reference.

Bur. of Plant Indust. Bulls. 213 and 255.

RASPBERRY YELLOWS OR MOSAIC

Raspberry yellows is a troublesome disease which is not well understood, its cause being as yet unknown. It is of such frequent occurrence on Marlboro plantations that it is frequently spoken of as the Marlboro disease. Plants attacked by it have a stunted, yellowish appearance, somewhat suggestive of the Bermuda lily disease. The fruiting branches are small, often not over half their usual length. The leaves are small, curled downward at the edges, and faintly mottled with yellow. Some of the berries dry up without ripening; others ripen but are small and flavorless. Many of

the leaves also wither. New canes do not appear to be seriously affected. The leaves do not wither but some of them may be much mottled, while others are normal. The canes themselves seldom show injury, and the roots appear to be unaffected.

Control.—No remedy or preventive is known. Experiments in spraying and in methods of fertilizing under the direction of the Geneva, N. Y., Experiment Station, proved of no avail.

References.

Geneva, N. Y., Expt. Sta. Bull. 226.

Melchers, Ohio Naturalist, Vol. 14, No. 6, pp. 281–288, Apr., 1914.

TOADSTOOLS

A toadstool fungus, *Armillaria mellea*, is reported to cause much damage to raspberries and blackberries in the state of Washington, though the toadstool itself is not commonly found.

No cure is known. Removing and burning affected plants is the only remedy suggested.

Reference.

Wash. Expt. Sta. Bull. 3, Special series.

PART III

THE GROSELLES

There is no English word in use which includes both currants and gooseberries. Since there is an evident need for such a term, the word groselle was adopted in the original edition of this book. This is a modification of the old French word *groiselle,* or *groisselle,* which was used for both these fruits before a separate term was employed to designate the currant. The present French word *groseille,* meaning a gooseberry, also formerly included both.

CHAPTER XI

CURRANTS

The currant, though less extensively cultivated than some of the other small fruits, fills an important place in the pomology of our country. Its sprightly and healthful qualities render it desirable to the consumer, and its staple character makes it a comparatively safe crop for the producer. It is almost wholly a northern fruit, having no commercial importance in the southern states. Neither currants nor gooseberries receive notice in "Florida Fruits," by Helen Harcourt, though other small fruits do. It does not prosper in hot and dry climates. Even in

Nebraska it does not succeed well. The plants thrive and look healthy, but are comparatively unproductive. The fruit is but little seen in market, which is probably the result of unfavorable experience.

The total area devoted to currants in the United States, as reported in the census of 1910, is 7,862 acres. The total production is given as 10,448,532 quarts, valued at $790,431. The Middle Atlantic section leads in production, with an area of 3,239 acres. The smallest area is found in the East South Central division, which reports only 16 acres. This is followed by the West South Central and the South Atlantic sections, with 46 and 80 acres respectively.

The total area under cultivation ten years before, in 1899, was 12,863 acres. This shows a decrease of 5,003 acres or about 39 per cent within that decade. All small fruits show a decrease during that period but with none of the others is the percentage so great. With blackberries and dewberries the falling off is but slight, and comparatively unimportant with strawberries. Since the currant crop is one easily grown, this seems to indicate that the demand is not keeping pace with that for other fruits.

There seems to have been a boom in currant culture about 1856, so that American nurserymen were not able to keep pace with the demand.[1] In later years there was but little fluctuation, the demand having been steady but limited. The market for currants is entirely different from that for other small fruits, such as strawberries, raspberries and blackberries. Although a healthful and

[1] Horticulturist, 1856 : 210.

appetizing dessert fruit, it appears to be little used for that purpose. Where hundreds of crates of strawberries are consumed each year and where raspberries are always in demand, it is often difficult to dispose of one crate of currants, to the grocers who handle other fruits. Apparently they are little used except for jelly, and few even for that. For many growers the only market is the wholesale one in some distant city. This means that the crop must be grown on a wholesale plan if any profit is to result.

SOIL AND LOCATION

Currants will thrive and bear some fruit on almost any soil, but their natural habitat indicates that to produce really satisfactory and profitable crops they need a cool and moist soil. Experience has fully demonstrated this fact. The best results are, therefore, to be expected from strong clay loams. Even a stiff clay, under good culture, will be found satisfactory. Strong, moist, sandy loams, if not too light, are also good. In the selection of a site, the natural habitat of the plant will point to a cool northern exposure. A proper site may in part offset the disadvantage of an unfavorable soil. Low, moist ground, with some reduction in the intensity of the sun's rays, will be found advantageous. For this reason the currant often thrives well in orchards. This is most satisfactory in those regions approaching the limit of its adaptability to culture. For family use, it may be planted on the north side of buildings or fences. Mulching tends to accomplish the same end, since it keeps the soil shaded and cool.

Regions somewhat elevated are generally more satisfactory than lower altitudes, especially toward the southern limits of its range. In Pennsylvania better fruit is said to be produced at an elevation of 1,000 feet than on plateaus near the sea. The leaves fall earlier on the lower lands, and the fruit is smaller in consequence the succeeding year.

FERTILIZERS

The currant is a rank feeder, and needs a rich soil, with liberal fertilizing. Yet the roots are small and fibrous, and do not extend far for food. It must be supplied in liberal quantities and close at hand. While no fruit will live and apparently thrive under greater neglect than will the currant, it is equally true that no fruit will more quickly or fully respond to liberal treatment. Too often it is relegated to the fence corners, without care or culture, there to battle with sod, currant-worms and leaf-spot from year to year. Little wonder that the returns are sour and small!

Liberal applications of stable-manure, preferably in the fall or winter, supplemented with the addition of wood ashes, or potash in the form of commercial fertilizers, in the spring, are always in order. Currants contain [1] 0.11 per cent of phosphoric acid and 0.27 per cent of potash, while stable-manure contains only about one-third more potash than phosphoric acid, which suggests the need of additional potash. There is little danger of too rank growth or of diminished fruitfulness from an excess of stable-manure. Observations at the Massachusetts State

[1] Exp. Sta. Handbook, p. 402.

Experiment Station [1] show that the desirable qualities of the fruit were increased in every case by the application of potash fertilizers. A comparison of sulfate and muriate of potash at the Geneva (New York) Experiment Station showed no practical difference in favor of either.[2] To sum up, fertilizing for the currant does not differ from that required for other fruits, except that it needs to be more liberal than in most other cases, if satisfactory returns are to be obtained.

PROPAGATION

Currants are readily propagated from hardwood cuttings made from well-ripened shoots of one season's growth. The cuttings may be taken and planted either in fall or in spring, but the common custom among nurserymen is to take them in early autumn, as soon as the leaves mature. The leaves commonly begin falling as early as August, but they are frequently stripped a week or so before the cuttings are taken, which is usually done the last of August or first of September. They may then be planted at once, or tied in bundles and buried upside down with two inches of soil over the butts. In this position they may callus, and even form roots, before winter.

They may be taken up and planted later, removed to a cellar and buried in sand during the winter, or be given an additional covering and be left where they are until spring. If planting is deferred until spring, it must be done very early, as they begin growth at a low tempera-

[1] Mass. Agr. Rept. 1884 : 444. Exp. Station Bull. 7.
[2] Annual Rept. 1890 : 283.

ture, and must receive attention at the earliest possible moment. The commoner practice is to plant in nursery rows soon after the cuttings are taken. They are said to root more quickly if packed in damp moss a week or two before planting. The cuttings are ordinarily made from six to eight inches long, though the older writings recommended them to be a foot long. The base should be formed with a clean, square cut just beneath a bud. The top is commonly a slanting cut some distance above the uppermost bud.

Planting may be by means of a spade, but is more conveniently and rapidly done by plowing furrows and setting the cuttings against the land-side of the furrow. One or two buds only are left above the surface of the ground, and the earth should be firmly packed about the base of the cuttings. If set early in September, many of the plants will form roots and establish themselves before winter, being in condition to begin growth immediately in spring. As freezing weather approaches, a shovel plow is sometimes run through the rows, in order to throw the earth toward but not over the cuttings. This leaves a depression along the rows, and the plants are then easily protected by covering with straw or coarse manure. Mulching in some form is essential during the winter, if the cuttings are planted in the fall. Rich land should be selected, and heavy dressings of well-rotted manure are useful.

G. A. Marshall, of Arlington, Nebraska, an experienced nurseryman, gives the following method of propagation. As soon as the leaves fall, which is about September first, the cuttings are made, nine inches long. Much of the

Plate IX. One-year currants.

success of the operation depends on long cuttings in the dry climate and light soil of Nebraska. They are then buried with the butts up and about three inches beneath the surface of the ground. About the first of November they are taken up and planted in nursery rows, and a ridge of earth thrown over them so that they are covered about two inches deep. In the spring this covering is raked away, so that the tips are left just below the surface of the ground. This method is interesting, because it shows something of the modifications demanded by a dry climate.

Single-eye cuttings under glass, or greenwood cuttings, may be used, but are less satisfactory than hardwood cuttings, and are only used under special circumstances. Plants may also be grown from layers, and even from tip layers, like the black raspberries, but these methods have little to recommend them. It was formerly advised to cut out all the lower buds in planting cuttings, in order to insure a tree form of growth, but this is seldom practiced now. Plants so grown are of interest as curiosities or novelties, but are not satisfactory in field culture.

New varieties are grown from seeds, which should be taken as soon as the fruit is ripe. They may be washed from the pulp and dried like vegetable seeds, but it is better to sow or mix them with sand at once, and not allow them to dry. If mixed with sand, they should be buried or kept in a cool, shady place, and sown very early in spring. They may be sown, not over half an inch deep, in flats or in the open ground, in fine, rich and mellow soil. Partial shade and a light mulch of fine manure will aid in retaining moisture and prevent the ground from baking.

The seeds germinate at a low temperature, and are likely to start too early unless kept in a shaded place. If sown at once in flats, the flats can be kept in a cool, shaded place during the winter, and given partial exposure in spring. Plunging them in the soil will aid in preserving moisture, and covering with a wire screen will insure safety from destruction by mice or other animals. If a greenhouse is available they may be brought inside toward spring, where the seeds will germinate quickly. The young plants may be potted off when two or three inches high, and planted out when well established.

PLANTING

The first essential in planting fruit is a thorough preparation of the soil. For currants, the land should receive a heavy dressing of stable-manure, and be plowed deep. If the underlying layers are hard and impervious to roots and moisture, subsoiling may be of value. Under-draining will be better. One may choose almost any distance apart to set the plants, and find it recommended somewhere in horticultural literature. The distances advocated vary from three-by-four feet to five-by-eight feet, with every possible intermediate combination. Rows six feet apart, with the plants four feet apart in the rows, will generally be satisfactory. If the design is to cultivate both ways, five feet apart each way may be better. Cross-cultivation is commonly only needed at intervals, and the wider row should be in the direction most convenient for cultivating.

The land should be in fine, mellow tilth, as deep as plowed. It should then be marked both ways, with fur-

rows in one direction. It will be still better if these furrows are made deeper than necessary to receive the plants, in order to insure their being set in a well-fined bed. The setting is easily done by placing the plants against the land-side of the furrow and drawing the earth about them, packing it firmly with the feet. No one point is more essential than this thorough firming of the soil about the roots. A layer of loose, fine soil should be left at the surface, to act as a mulch and prevent the packed soil beneath from drying out. The remainder of the furrow may be filled in as cultivation progresses later on. One-year-old plants, if vigorous and well grown, are quite as satisfactory and cost less money. They are easily set, meet with little check in transplanting, and make a better growth than if left in the crowded nursery row during the same time.

The earliness of the currant in starting into growth in spring is a point in favor of fall planting. This depends so much upon climate that it is unsafe to lay down a general rule. Throughout the western plains, where the winters are dry and open, fall planting is always uncertain, though with careful protection it may succeed. Whatever the location, if the planting is undertaken early enough in spring there is nothing to fear. If neglected until the plants have started into growth, the check must always seriously affect the first season's results.

SUBSEQUENT TILLAGE

Cultivation of the currant should be shallow. The roots run near the surface, and are likely to be injured by

plowing, or even by the ordinary cultivator. Frequent stirring of the soil with a light harrow-tooth cultivator or a spring-tooth cultivator having the teeth set well back, is most desirable. It may be owing to this habit of shallow rooting, that both the currant and the gooseberry succeed especially well with mulching. Any refuse material like straw, weeds, wild grass, or even coal ashes, may be used. The mulching not only replaces cultivation in keeping down weeds and retaining moisture, but helps to keep the fruit clean as well. This is a good way to grow currants for family use, especially if they occupy small or inaccessible corners of the yard or garden, where cultivation is inconvenient or must be done by hand. In the well-arranged fruit-garden, where the plants occupy definite rows, and also in field culture, cultivation is more practicable than mulching.

PRUNING

Pruning the currant is often neglected, yet productiveness is largely dependent on it. Plants will produce some fruit no matter how treated, hence are likely to be treated very indifferently. The fruit is borne both on old and on young wood. That which is best, and the most of it, is formed near the base of the one-year-old shoots and on short one-year-old spurs from the older wood. Consequently, most of the young wood may be cut away, or the old wood may be cut out, leaving young shoots, and fruit will still be produced. The younger the wood the finer the fruit, as a rule, but the plants are likely to be less productive unless a fair supply of wood more than one year old is

left. Yet this older wood soon becomes weak, and produces small and inferior fruit.

The older plan of training to a tree form (Fig. 39), by removing the lower buds from the cuttings when planted, is now practically discarded. The plants are less productive, and if attacked by the currant borer, the whole plant is destroyed instead of a single stalk, as when grown in the bush form. If the tree form is desired for novelty or ornament, six or eight shoots are selected, as the bush develops, to form permanent branches. These are cut back to four to six inches every year till the bush is full grown, and afterward to only two or three buds. All lateral shoots are cut to within an inch of the old wood each year.

Fig. 39. Tree-form currant.

For practical field culture, from four to eight main

stems are allowed, and these should be frequently renewed. Wood over three years old should seldom be allowed to remain. Some expert growers of long experience say that none over two years old should be left. Superfluous young shoots should also be cut away, but the buds at the base of these may well be left, as they develop into fruit-bearing spurs. A difference of opinion exists in regard to cutting back the young growth. The longer the old wood is left the greater will be the demand for cutting back. This method may give increased productiveness, but finer fruit will result from frequent renewing. The more vigorous shoots may be shortened-in, to prevent the bush from becoming straggling, and to preserve its balance. Since the greater part of the fruit is borne near the base of the shoots, shortening these may tend toward a better development of the fruit spurs, especially if the shoots are nipped back in summer, when they have reached sufficient height. In common practice, cutting away part of the older canes at the ground in spring, is all that is needed. If too many young stalks have been produced, the weaker ones should also be removed.

Experiments in thinning the fruit, made in New Jersey,[1] showed that when the outer half of the flower-cluster was removed with a pair of scissors there were 15 per cent more berries to the cluster, and the berries were 7 per cent heavier. The quality also seemed to be better.

Various fancy methods of training are resorted to by those with a taste for oddities. Sometimes they are trained in "pillar" form, one upright shoot being tied to a stake and the side branches kept very short. They may

[1] Garden and Forest, 3 : 19.

also be readily trained against a wall. It is said that especially fine fruit may be obtained on a north wall. They have even been grafted, from time to time, in order to secure standard or tree forms. *Ribes odoratum* is the stock most commonly used for this purpose. These methods were chiefly in vogue early in the horticultural development of our own country, but are now little used. The demand for the currant is not such as to warrant fancy methods in the hope of a fancy product. Good care, liberal feeding and frequent renewal of the bearing wood are all that conditions warrant, except as a pastime.

GATHERING AND MARKETING

The currant, like other small fruits, should be picked only when dry. Although a firm fruit, which stands shipment well when properly treated, it will quickly spoil if gathered and packed when wet. Much care is needed to prevent pickers from crushing the berries or tearing them from the stems. It is far easier to grasp a cluster and give it a pull than it is carefully to sever the stem. Only the strictest vigilance will insure proper care in the work. This is written with a distinct remembrance of the work of some Irish girls, who thought it much more convenient to strip the berries from the clusters and throw them into the middle of the baskets loose, than to pick the stems at all. All such berries will quickly spoil; the juice which exudes from them will soon render the others wet and sticky and a general collapse of the whole package will result. Varieties like the Fay, which have more clear space of stem at the base of the clusters, have a distinct

advantage in this regard. They can be more easily picked without crushing any of the fruits.

For shipping purposes, the fruit must be picked while still hard and firm, in order to carry well. For home use or near market it should not be picked too soon, especially for dessert use. If left on the bushes until thoroughly ripe and soft, they make an admirable dessert fruit when eaten fresh. For this purpose the White Grape is one of the best, being less acid than most varieties. The fruiting season may be prolonged until autumn, if the fruit is protected by covering the plants with light cheesecloth or netting.

The fruit is commonly marketed in quart baskets, put up in bushel crates like other berries. Of late years the grape basket has been gaining in favor as a package, and is now extensively used. The nine-pound basket is the size preferred by most markets. This is a convenient size for the consumer, especially if purchased for jelly or preserving.

USES

The paramount use of the currant is in making jelly, for which purpose it is unsurpassed. The red varieties are preferred owing to their higher color. White currants, if scalded before pressing, are said to make a rich, red jelly, not as dark as that from red varieties, but very handsome. The fruit, either green or ripe, makes excellent pies or sauce. It is especially satisfactory when used in combination with fruits which lack sprightliness or acidity. With a few currants added, even the Russian mulberry becomes an appetizing fruit, and the june-

berry is all that one could wish. The currant supplies the requisite acidity, while these fruits furnish the richness of flavor which the currant lacks. In canning it preserves its qualities intact, so that it is nearly as available in winter as in summer. Currant shrub is a pleasant summer drink, made from the ripe fruit crushed and compounded like lemonade. The juice is said to be very useful in soothing fevers. At one time the fruit was reported [1] as having a steady demand in St. Louis for use as a flavoring in soda water.

As a dessert fruit the currant is not appreciated as it should be. Thoroughly ripe fruit, crushed and mixed with sugar some time before being served is a most appetizing summer fruit. Nature seems to have just adapted it to the needs of the hot weather season during which it ripens. The ability of the fruit to hang on the bushes so long after it ripens adds greatly to its value for use in this way. Taken all in all, no member of the bush-fruit family better deserves a place in the home-garden than does the currant. It adapts itself so well to the varying conditions there found, and returns so much for the care demanded that it should find a place with every home which can have a garden.

DURATION OF CURRANT PLANTATIONS

The length of time during which plantings will continue productive will depend much on the care and treatment which they receive. Downing advised [2] renewing them every six or eight years, as finer fruit, with less trouble,

[1] Illinois Hort. Soc. 1890 : 157.

[2] Fruits and Fruit Trees of America, 488.

can be had from young bushes. He was then recommending the tree form of culture, however, and these fail sooner than when a number of stalks are grown and renewed as fast as they become weak. To the ordinary farmer it seldom occurs that they need to be renewed at all. A currant bush, once planted, should care for itself and last indefinitely or at least as long as an apple-tree. That is just what the plant ordinarily does under the conditions to which the farmer too often subjects it. It looks out for itself, devoting little energy to the production of a high grade of fruit.

So, also, with good care, liberal fertilizing and frequent renewing, bushes may be kept in a profitable condition for many years. Practical growers, however, seem to find it advisable to replant after eight or ten years of service. The cost of replanting is light, and the advantage of young and vigorous plants will more than repay it. If one desires to rejuvenate old bushes in the home-garden, cutting them off close to the ground and working manure into the soil will infuse new life into them.

HARDINESS

Ability to endure cold hardly enters into consideration with the currant. It endures the most severe winters, in the extreme northern limits of the United States at least, and comes out in spring with every bud unharmed. The question of hardiness here centers not on resistance to cold, but on ability to endure heat. In this it fails, as already shown by its distribution and its more or less complete failure in warm climates.

Plate X. Well-grown, two-year currants.

YIELD

Perhaps no fruit grown varies more in yield than does the currant. This is largely owing to the fact that it will grow and produce something under almost any kind of treatment. The average yield for the United States in 1909, according to census figures was only a little more than forty bushels to the acre. Yet there are growers who report as high as 250 bushels. With good care they ought to yield from 100 to 150 bushels an acre. It should be remembered that there are many drawbacks to the production of all kinds of fruit. While such yields may seem easy to obtain, when compared with the exceptional ones occasionally reported, it will be found that only by high culture and careful attention to details will even these yields be reached. In garden culture, from two to four pounds per bush may be expected. As instances of exceptional yields, five and one-half tons from one and one-fourth acres, or 220 bushels to the acre, have been reported from the Hudson River valley, six quarts to a bush, or 320 bushels to the acre from Ohio, and sixteen tons from three acres from Wisconsin. Let no one mistake these for probable yields, in forming estimates of the results likely to follow prospective planting. Such yields tend to awaken enthusiasm on the part of the novice, but while the currant is one of the most productive of the small fruits, such returns are seldom secured on a commercial scale.

PROFITS

Profits vary greatly, not only with methods of culture, but also with conditions of the market. At times they have proved unprofitable; and again they have yielded large returns, but this fluctuation is no greater than with other fruit. Indeed there is reason to think that production varies less than with many other fruits. Under some conditions they have proved more profitable than strawberries or raspberries. To the skillful grower who is near a market or has good facilities for shipping, the currant will prove profitable. To the ordinary farmer, unaccustomed to their care, and remote from market, they will prove unprofitable. At six cents a pound or eight cents a quart, they should prove a satisfactory crop. Canning factories use them in large quantities at about four cents a pound. They weigh about forty pounds to a bushel, making this equivalent to $1.60 a bushel. This, with a convenient location and good culture, to insure a yield of not less than one hundred bushels an acre, will yield a fair return, if pickers can be had in sufficient numbers, so that enough can be grown to make it an object.

BLACK CURRANTS

The treatment of the black currant does not differ materially from that of the red. The bushes grow a little taller, and may require a little more room. This can be easily given, for in most localities one bush will supply the demand of the entire community. A convenient method of pruning the black currant is quoted from the Garden by the Canadian Horticulturist, 1896, page 198.

It consists in cutting out the bearing branches when the fruit is ripe, carrying them to a shady place and there picking the fruit at ease. The annual renewing thus given is said to produce well-ripened wood and fine fruit, since fruit borne on old wood is much inferior.

Notwithstanding the lack of popularity of the black currant in America, we might do well to cultivate it more than we do. It undoubtedly possesses more value than we accord to it. It is said that if the fruit is scalded for a few minutes in boiling water, then put into fresh water for cooking, the peculiar flavor of the skin will be wholly removed, and that when canned it is much like cranberry sauce in flavor and color. The fruit is credited with some medicinal qualities, especially in alleviating inflammation or soreness of the throat. Jelly from the fruit, mingled with water, or the parts of the plant steeped, are said to be useful in bowel and summer complaints. Persons accustomed to its use certainly relish it, especially for jam and jelly.

Fuller states that the people of Siberia use the leaves for making a drink the same as we use tea. Loudon says that the dried leaves so much resemble green tea in flavor that a very small portion of them added to black tea will communicate that flavor so effectually as to completely deceive the taste. From Loudon's statements it appears that the fruit, either dried or in the form of jam or jelly, is very widely used throughout Europe against affections of the throat.

CHAPTER XII

GOOSEBERRIES

The gooseberry is one of the lesser of the small-fruits of the United States. It is apparently prized and appreciated less than almost any other fruit. It is extremely sour, and the custom of using it only in the green state prevents some of its qualities from becoming known. Many persons do not care for it, and the demand is much less than for the berry fruits, while the supply is often more than correspondingly less. In spite of this apparent indifference, it has many good qualities to commend it. In the green state, as generally sold, it bears shipment exceedingly well, reaching the consumer, when properly handled, with no waste, and in as good condition as when it left the plants.

The total area devoted to gooseberry culture in the United States in 1909, according to the census report, was 4,765 acres. This was nearly 2,000 acres less than ten years before, when the amount reported was 6,752 acres. New England, and the Mountain divisions show an increase, all others a decrease, though in the Middle Atlantic section it is so slight as to be negligible. The East North Central division leads, with 1,482 acres in 1909. This is closely followed by the West North Central division, with 1,232 acres. It outranks the currant in the South Atlantic and East South Central divisions, but falls behind

it in the West South Central section. The total production is placed at 5,282,483 quarts, valued at $417,034, an average price of nearly eight cents a quart.

Like the currant, the gooseberry is a northern plant, and refuses to be content in a hot climate. It fails in the southern states and almost completely along the Gulf coast. In Nebraska it seems to thrive better than the currant. Its leaves fall early, and the fruit is decidedly smaller than in the eastern states, but the plants make a good growth, appear healthy, except in the early loss of leaves, and are fairly productive. The English varieties produce an occasional fruit, but so far as tested may be termed an utter failure. It should be remembered that the summers on the plains are hot and dry, consequently unfavorable to these fruits. Frequently, however, the early part of the season is favorable, so that the fruit has an opportunity to mature before severe heat and drought affect it. The chief injury in that case is undoubtedly due to the early loss of leaves and consequent enfeebled condition of the bush the succeeding year.

SOIL AND LOCATION

The gooseberry is much like the currant in its soil demands. A cool, moist, strong and rich soil, deeply worked, is the requisition which it makes. The more unfavorable the location in the way of climate, the more closely will this demand in the way of soil need to be met. Well to the north, in high altitudes, or cool northern exposures, it will succeed well on sandy or even gravelly loam, though the rule is that the lighter the soil the less satisfactory

the crop. However, the opposite extreme is not advisable. A muck soil will produce a strong growth but diminished productiveness, while a heavy, cold clay is hard to work, and may cause the bushes to heave. A strong clay loam, not liable to injury from drought, but well drained, well enriched, deeply worked and subsoiled, is the ideal. A cool northern exposure is desirable, if it can be had. Partial shade may be an advantage, but the plant does not appear to thrive under the shade of trees as well as the currant. For home use, the north side of a fence or of buildings is a good location. Proper selections of soil and location will do much to preserve a healthy condition of the bush, retain the foliage and prevent mildew.

FERTILIZERS

Growers of long experience agree that no fertilizer is better for gooseberries than good cow manure, liberally applied. The plants are gross feeders, and a heavy top-dressing every autumn will be profitably utilized. This may be supplemented with a dressing of wood-ashes, or other chemicals, early in spring, if the supply of stable-manure has been limited. The soil must be rich, to insure good results.

PROPAGATION

The propagation of the gooseberry is similar to that of the currant, though it does not root so readily from cuttings. The wood does not mature as early in the fall as that of the currant, so that planting is oftener delayed until spring, though the cuttings may well be taken in fall,

and be buried outside or placed in a cellar for winter, as directed for currants. If left until spring, they must be taken very early, as they push into growth at the first touch of warm weather. Cuttings are made from six to ten inches long, using only well-ripened wood of the current season's growth. Formerly the lower buds were cut out before planting, in order to prevent suckers from springing up, thus securing a tree form of growth. This is no longer followed in commercial growing, though it may be desirable where attractive bushes are wanted for the garden. The soil should be pressed firmly about the base in planting, and only one or two buds be left above the surface of the ground. Thorough mulching is imperative, if the cuttings are planted in the fall.

Some varieties, like Houghton, root readily from cuttings, but Downing and other strong, vigorous growers do not, consequently layering is oftener used. It is generally believed that stockier and better plants are obtained from cuttings. Bent layers root readily, but this is too slow, and the number of plants produced is too small for commercial work. Mound-layering is the method generally followed. For this purpose the plants are cut back severely in autumn, to induce many shoots to grow the succeeding spring. About July 1, when these have made their principal growth, earth is mounded up about and among them, leaving only their tips exposed. American varieties will root readily, and may be removed the same autumn, but English varieties are left in this position for two seasons. The last of October, or before the ground freezes, the soil is thrown back, and the shoots are cut away and trenched or buried in the cellar for spring

planting. In commercial work two grades are commonly made. In spring they are planted in nursery rows and cultivated for one year, when they are ready to go on the market. Some roots will have formed during the process of layering, and the plants will be in condition to make a much better growth when planted out than cuttings taken without previous layering.

Spring is a busy season with the nurseryman and fruit-grower, and the gooseberry is very impatient at the approach of warm weather. For this reason the layers are often planted in nursery rows when removed from the parent plants in fall, and mulched during winter. In favorable climates this will prove satisfactory, but where the winters are dry and open, as on the plains, the loss of plants is likely to be large, unless they are wholly covered with earth. If bushes are to be managed principally or exclusively for the production of plants, they should be set in rows eight feet apart and close together in the row. This will facilitate the work of mounding and removing the soil in layering, as much of it can be done with a plow.

For home use, the suckers which spring up about the base of the old plants may be removed and planted. They commonly have some roots attached, and grow readily. The older writers warn us against their use, but apparently for the reason that they, too, are likely to throw up suckers from the roots. When the fashion was to grow the plants only in tree form this was considered a serious fault. Bent layers may be employed in a small way. By this method, the branches are held beneath the soil by a forked peg and the tip allowed to grow upward. A slit is made on

the under side of the arched portion which is buried in the ground, to induce more rapid rooting, by checking in some degree the flow of sap from the parent plant. Layering the tips, like black raspberries, is also said to succeed, though not a common method.

A writer in the "Gardener's Monthly" for 1885, p. 49, says that the readiest and quickest way to propagate the English gooseberry is by pieces of its own roots. Old bushes are dug up in spring, the roots chopped in pieces three to four inches long, and planted in nursery rows three or four inches deep. He says that they will grow more in one year than a cutting will in two or three. This method is certainly not in common use. Two trials in the greenhouse early in spring, embracing both English and American varieties, resulted in complete failure.

New varieties must come from seeds, which should be treated as directed for currants. It is not difficult to grow plants by this method. There is likely to be little retrogression, and in rare cases there may be an advance in valuable qualities. A French article which appeared in the Horticulturist in 1849, translated from the Revue Horticole, states that seedlings withstand the heat of French summers much better than cuttings, and recommends propagation by seeds rather than by other methods for that climate.

Grafting is easily performed, the Missouri currant being the stock oftenest used. According to Robert Manning,[1] the best results are obtained by side-grafting under the bark in August, the top being cut down in spring and the snag removed afterward, as with budded trees. Al-

[1] Trans. Mass. Hort. Soc. 1879: 37.

though quite extensively practiced at one time in the production of standard bushes, and as a supposed remedy for the mildew, the fad soon died out.

PLANTING

The methods of planting recommended for the currant are equally applicable to the gooseberry. If rows are placed six feet apart in the direction most convenient for cultivating, and the plants four feet apart in the opposite direction, in order to afford opportunity for cross cultivation when the plants are young, and at intervals thereafter, they will have room enough for proper development, with convenient space for their care and for gathering the fruit.

The same arguments as with the currant will apply to the choice of season for planting. These fruits drop their leaves so early that fall planting may be done much earlier than with most other fruits, even in September, allowing the plants to become well established before the advent of cold weather. This is one of the hardiest fruits, but the grower who withholds the proper care in planting will inevitably reap the recompense for his neglect.

AFTER TREATMENT

Since the gooseberry is subject to greater injury from drought than the currant, there is the more urgent need of complete and thorough cultivation. As with the currant, it should be shallow but frequent. Hardness and dryness of the soil are especially injurious. The better

the cultivation, the cooler and moister can the soil be kept, and hence the nearer will be the approach to the normal conditions under which the plant thrives. Like the proper selection of soil and location, suitable cultivation will materially aid in preserving the health of the plants and preventing mildew, though by no means a remedy for that disease. Mulching also succeeds well, preserving the soil in a cool and moist condition even better than cultivation. Deep tillage must be carefully avoided. Disturbing the roots is likely to cause imperfect setting or subsequent dropping of the fruit. Both the groselles and especially the gooseberry, are very sensitive to root conditions. An untimely and improper cultivation may practically destroy the crop. Allowing the soil to go without mulching or tillage is also injurious if the surface becomes dry and hard.

PRUNING

Left to itself, the gooseberry soon becomes a tangled thicket, the fruit in consequence being small and difficult to pick. It produces much more wood than ought to remain for each year's fruiting. This must be reduced, if the best results are to be secured. The particular manner in which it is performed is of far less importance. Berries are produced from all parts of the bush except the present year shoots and the very old wood, but the finest fruits are borne on one-year-old branches. After two or three years in bearing the wood begins to fail, and the fruit borne from it likewise declines. The principle, therefore, should be to carefully guard the vigorous young wood,

allowing it to replace that which is older before the latter has a chance to fail. The weak young shoots should be cut away, or perhaps be cut back to two or three buds, if the bush is still thin. The vigorous ones may be moderately cut back, and as much old wood cut away as can be spared without interfering with the productiveness of the bush.

Benj. G. Smith states [1] that he prunes as carefully as he does grape vines, some on the spur system and some with long shoots, with equal success. This is significant, in showing that the method is of minor importance. The essential thing is to so renew that the bearing wood shall always be strong and vigorous, and the amount of such wood not greater than the bush is able to support and fill with well-developed fruit. In northern localities an open top is desirable, but where the summers are hot a thicker growth, with more shade, may be better. Shortening-back the lower branches severely will aid in keeping the fruit up from the ground.

In the tree form of pruning, from six to ten main branches are allowed to grow, and all suckers are cut away. These main branches may be allowed to divide as the bush gets older. They are annually shortened to a few inches of new growth and the side shoots cut back to from one to four buds.

In practical culture, thinning is all done by the amount of wood removed. In the production of prize berries, as practiced by English growers, thinning is an absolute necessity. The largest fruit can only be produced by closely limiting the number which the plant is allowed to carry. Thinning is no less important in commercial work,

[1] Trans. Mass. Hort. Soc. 1883: 123.

because done by removing wood, instead of individual fruits. It is well to keep this fact in mind in all pruning operations.

Various methods of training have been reported. In some cases they have been trained as single stems and tied to stakes; in others they have been made to cover arbors by carefully training up shoots at given distances apart. Some very remarkable bushes have been reported. In the tree form they have been said to reach a height of sixteen feet, and others have been trained as standards with clear stems five feet high. In the "Transactions of the London Horticultural Society," Vol. V, p. 490, a plant is reported which was forty-six years old, measuring twelve yards in circumference and which had produced several pecks of fruit annually for thirty years. Another, thirty years old, was trained to a building, and measured 53 feet 4 inches from one extremity to the other. This bore four or five pecks of fruit annually.

GATHERING AND MARKETING

Picking gooseberries is difficult on account of the thorns. The Downing, our best well-tested variety, is one of the worst in this respect. This feature does much to check increased cultivation of the gooseberry. Vigorous pruning, to keep the bushes thin and open, will materially aid in the matter, and the picker soon learns to avoid too careless contact. Another method of circumventing the difficulty is possible, from the fact that the berries are marketed when green and hard. This consists in wearing thick leather gloves and in stripping the berries from the branches.

They are then run through a fanning mill to drive out the leaves. This method is most satisfactory in commercial work. It will not answer for ripe fruit, which is too easily crushed. Pickers are paid about 1½ cents a quart, and will average from sixty to one hundred quarts a day.

Some growers cut away the older stalks, which should come out the following spring, picking the fruit after removing them from the plant. Some fruit is usually pulled off in doing this and not much is gained by it except that the work may be conducted in a more comfortable place. It may help the busy housewife who has fruit to pick from her own garden, on a hot day, or suggest a way whereby the gardener himself may help.

At the present time the market calls for green gooseberries only. In this stage the fruit will carry almost any distance in first-class condition. Ten-pound grape baskets are excellent for shipping and general market purposes, though the quart berry baskets are still much used. It is a pleasure to pack this fruit for shipment. It is so clean and solid, and there is a feeling of security that it will remain so until it reaches the consumer.

The gooseberry, even more than the currant, seems to have fallen into general disrepute. This may be partly due to the fact that the housewife often thinks that she must snip off the stem and dried blossom of every fruit before it goes into the cooking dish. This is a tiresome task, and she may well be pardoned for not wanting to care for many of them. To try to convince her that this operation might be omitted is probably useless.

A few quarts may be sold to a family here and there, but even the larger towns and cities seem to demand but

few. If varieties with larger fruit, such as is commonly grown in England, could be successfully grown in our climate, the outlet would doubtless be better.

USES

The fruit is commonly used in pies, stewed, canned, or for jelly. That it makes a good jelly is evidenced by an ingenious process of imitating it reported by the "Gardener's Monthly" for 1884, page 204. This states that gooseberry jelly is made from seaweed, the color being given by fuchsine or similar material, and the flavor by a mixture of acetic ether, tartaric acid and other substances.

The good qualities of the gooseberry are not confined to the green state. The flavor of a well-ripened gooseberry is scarcely to be surpassed among fruits. Its value should be better appreciated. It is especially good to be eaten out of hand, as it comes from the bush. It also makes a fine table fruit when fully ripe, if crushed or cut and eaten with sugar, or sugar and cream. Unfortunately the acidity of the skin does not disappear with ripening. Indeed, when cooked, the ripe fruit is even more sour than the unripe. This makes it undesirable for most cooking purposes except in the green state.

T. H. Hoskins is authority for the statement [1] that ripe Houghtons are an excellent substitute for cranberries, as a sauce for meat. They are cooked enough to burst the skins, then put up in fruit cans, but not sweetened till wanted for use. Since they are much cheaper than

[1] Rept. Michigan Hort. Soc. 1884: 262.

cranberries, and can be grown anywhere, this method of using them is worth remembering. We too often look to the market for the products of distant points and fail to fully utilize those from our own gardens.

A method of keeping green gooseberries which seems to have been in vogue before the process of canning was known, consists in filling a jug or bottle with sound fruit, taking care that no bruised or crushed ones go in, then filling with cold spring or well water, corking tightly and putting away in a cool cellar. Hoskins states that they can be so preserved perfectly the year round, without sealing, though it is generally recommended to seal them. This method is certainly simple and, if as satisfactory as it is said to be, makes fresh gooseberry pie available at all seasons of the year. Another method of keeping, recommended by the "Prairie Farmer," is to put them into bottles when perfectly dry, then cork the bottles tight, cover the corks with sealing wax, and partially cover the bottles with sand or earth in the cellar.

DURATION OF PLANTATIONS

In the older method of pruning to tree form, the plants began to fail after six or eight years, and soon became unprofitable, generally bearing their best fruit about the fourth or fifth year from planting. In bush training, they remain in vigorous condition much longer. Plantations twenty or twenty-five years old, and still profitable, are not uncommon. Much depends on the thoroughness with which the renewing process is carried on. Liberal fertilizing and good culture will also aid greatly. Gener-

ally it will be found more profitable to discard them after ten or twelve years. Replanting is not expensive, and the younger plants will be more vigorous and bear finer fruit. A slight difference in the quantity and quality of crops will soon offset the cost of replanting. No rule as to number of years can be valid, for of two plantations of the same age, one may still be perfectly satisfactory and the other wholly unprofitable, owing to differences in treatment and conditions. In commercial work, a safe rule will be to replant as soon as the first trace of waning vigor can be detected. It is not a question of how long they will continue to bear well, but of which will prove the more profitable, the old planting, with its regular care, or a new one, with the added expense of another planting. If these points were carefully weighed, replanting would doubtless be much more frequent than it now is.

HARDINESS

Cold has apparently no effect on the gooseberry, at least such temperatures as are likely to be reached anywhere in the United States, and even far to the north. It stands unprotected through our severest winters without the loss of a bud, but if moved southward it soon becomes uncomfortable. It cannot endure scorching summer suns.

YIELD

Full grown plants, vigorous and well cared for, ought to yield from five to eight quarts to the plant, or, roughly speaking, from 300 to 500 bushels to the acre, with plants

four by six feet apart. One-half bushel to a plant, set at this distance, has been reported from Canada. This is exceptional, and should not be considered as a basis for estimates. At the Geneva, New York, Experiment Station, in 1891,[1] plants gave an average of over ten pounds of fruit each, or about eight quarts. This would make about 450 bushels to the acre with plants set four by six feet apart. Fuller[2] says that from 200 to 400 bushels to the acre of native sorts can be grown. The average yield for the United States as a whole, as deduced from the figures for acreage and total production given in the 1910 census, is only 35 bushels to the acre. The reader may make his own contrasts and draw his own conclusions.

PROFITS

When the market is at hand the gooseberry is one of the most reliable and generally one of the most profitable small-fruits grown. The price a quart is not high, but the yield is large and the loss little. The average price in the New York market seems to be about $2 a bushel, though fine fruit sometimes reaches double that price.

Of all small-fruits the gooseberry is the one best adapted to long-distance shipments. If a large city market can be reached without too great cost it may pay well to do it. In some localities the home market is doubtless worth cultivating. Attempting to educate the public is generally a thankless task, but if persons could be taught to use the ripe fruit as well as the green, the consumption of the gooseberry would be greatly increased.

[1] Annual Rept. 1891: 474.

[2] Small Fruit Culturist, p. 222.

ENGLISH GOOSEBERRIES

Although frequent mention has been made of the English varieties, it may be well to say a word further regarding their culture in the United States. Like all European fruits, they have been tried again and again, yet they have only succeeded here and there, when meeting peculiarly favorable conditions. Benj. G. Smith, of Cambridge, successfully cultivated them for years, and occasionally other growers have succeeded, but the general fact remains that the English gooseberry is not a success in America. It may produce a few good berries when young, but is almost sure to fail later. It is said to thrive well on the northwest coast where the climate is more like that of England. In 1884, a motion was made at the meeting of the American Pomological Society to strike all English varieties from their list, but it was barely lost.

The reason for this failure of the large and fine English gooseberries in the United States is that they are constantly attacked by mildew. Any number of remedies have been suggested against the mildew in times past, the most common practice being to mulch the ground with manure, stones, tin cans, old boots, or other strange material which might be thought to possess especial virtue. Salt applied to the soil was vainly tried, and at one time grafting the plants on the Missouri currant was thought to be a remedy. Any of these things which afford a nearer approach toward the ideal conditions demanded by the gooseberry will aid in preventing the mildew, but none of them is infallible. Yet recent experiments show that under favorable con-

ditions we can grow the English gooseberry by giving it the proper attention. Thorough and vigorous treatment with potassium sulfide or with Bordeaux mixture, as directed under the discussion of this disease, will hold it in check and admit of satisfactory crops being obtained. No slovenly or careless work will answer; the treatment must be thorough, and done at the right time, or the enemy will still gain the mastery.

Whether the English gooseberries are worth growing, especially for home use, is a fair question. Their only advantage is in their size and appearance, which of course commend them for market growing. Most varieties are inferior to our own in quality. Many kinds have been grown at the Geneva, N. Y., Experiment Station and under their methods and soil conditions some of them are found successful. Mildew has, for some reason, been less troublesome in recent years than formerly.

Just why the gooseberry is so much more popular with the English than with us is hard to explain. Although their varieties surpass ours in size, they do not in quality. If we prized them as highly as the English we should doubtless have made more progress in improving our own varieties. The reader will find another account of gooseberries, by Beach, in Bulletin 114, New York Experiment Station.

CHAPTER XIII

VARIETIES OF CURRANTS

The currant culture of the United States is largely founded upon the European species bearing the name *Ribes vulgare*, Lam., although almost universally known heretofore as *R. rubrum* (Fig. 40). The latter name is now applied to the northern red currant found chiefly in northern Europe and Asia, which is rare in cultivation. The two species differ in a few minor botanical characteristics. The larger-leaved and large-fruited type known as "cherry currants" is recognized under the botanical name *Ribes vulgare* var. *macrocarpum*.

In its wild state the garden currant is a northern plant, chiefly found in cool damp locations, and it thrives best under similar conditions in garden culture. In cultivation, it has become somewhat variable in character of fruit and foliage. Instances are reported [1] in which both red and white fruits have been produced upon the same branch. In one case [2] three red, three white and one striped fruit were found in the same cluster. The red currant of northern North America, formerly confused with the garden currant seems to be the swamp red currant, now known as *R. triste*, Pall.

The European black currant belongs to the species *Ribes*

[1] Darwin, Animals and Plants under Domestication, 1: 400.

[2] Gardener's Chronicle, 26: 268.

Fig. 40. *Ribes vulgare* (×⅔).

nigrum, Linn. (Fig. 41). This species, like the red currants, readily adapts itself to American conditions, but the American people have not so readily adapted their tastes to its peculiar flavor. It has never become a popular fruit in the United States.

The American black currant, *Ribes americanum*, Mill., formerly known as *R. floridum*, seems to possess all the

good qualities of the European plant and is more ornamental. In recent years this species has received some attention from plant-breeders, notably Hansen of South Dakota, in his effort to breed hardier fruits for the Northwest. It cannot yet be considered a pomological species.

Fig. 41. *Ribes nigrum* (×⅔).

An American black currant oftener seen in cultivation is the Missouri or flowering currant, now given the botanical name *R. odoratum*, Wendl., but much better known under the erroneous name *R. aureum*. This is native to the eastern slopes of the Rocky Mountains. The better-known name *R. aureum* is now confined to a smaller-flowered species more commonly found west of the Rocky Mountains. The fruit of this black currant is very different from that of the two preceding species. It is often large, but produced in few-flowered clusters, and ripens

singly so that it must be picked one by one. Its flavor, though peculiar, has not the mawkish twang of the true black currants, but is not sprightly enough to make it a good culinary fruit. A form bearing large berries is sometimes offered under the variety name of Crandall.

Several species possess ornamental qualities of value; these are discussed later.

HISTORY OF THE CULTIVATED CURRANT

The currant is thought to have been unknown to the Greeks and Romans, as no mention of it is found in any of their writings. It seems to have first come prominently into cultivation about the middle of the sixteenth century, and according to Sturtevant,[1] received its modern improved form within fifty years following. The early English names "corans" and "currans" are thought to have been derived from the resemblance of the fruit to the little Corinth grapes or raisins, these in turn taking their names from Corinth. In England, at times, currants were known as "red gooseberries" and "beyond-sea gooseberries." An equivalent to the latter name, "groseilles d'outre mer," was also applied to them in France. These names indicate that, if not native to these countries, the cultivated forms, at least, were received from elsewhere. The Dutch name "over-zee" indicates the same thing. Sturtevant thinks that the currant was first brought into culture from the northern countries through the Danes and Normans, though DeCandolle appears to doubt this.[2]

[1] History of the Currant, Trans. Western New York Hort. Soc., 1887: 55.

[2] Origin of Cultivated Plants, 277.

The greatest improvement, however, seems to have been in the low countries.

All the principal types of the cultivated currants are found in the wild plants, and were reported at an early date. Improvement has only been within a limited range. Culture and fertility often appear to have a greater influence on this fruit than parentage. Thos. Andrew Knight [1] was of the opinion that by repeated growth from seed the currant would become sweeter, and perhaps in time, even insipid. The majority of seedlings grown by him from white crossed by red currants were red, but many first turned a color similar to the White Dutch, and then became brighter in color when ripe. He expressed himself as surprised at the range of variation which appeared, it being much greater than he had expected. Nearly all were mild and sweeter than the red parents, some were insipid, and some even showed a medicinal flavor. Experience does not seem to bear out his expectations in regard to an increasing sweetness, as the newer varieties are many of them more acid than older ones.

Currant seedlings appear not to vary widely as a rule and show little tendency to reversion, though one writer has reported that seedlings of Fay are generally smaller than the parent and that nearly half of them were white. Perhaps through its long sojourn in the low countries the currant has inherited something of the staid Dutch qualities of the inhabitants, and does not readily depart from long established customs. Yet no fruit, however stable, can long resist the influences of persistent and systematic breeding, and the currant has received too little

[1] Trans. London Hort. Soc. 3: 86.

attention in this line. There is no need that the currant should depart widely from the present types, for there is nothing wrong with them. A steady improvement along these same lines, with perhaps a limited reduction in acidity, is all that is needed, and there is no reason why this should not go on as long as horticulture exists.

The lists in this chapter and the next are intended to catalogue all the varieties of currants and gooseberries which have become prominent in this country up to the close of 1916.

RED AND WHITE CURRANTS

(*Ribes vulgare*)

Attractor.—A variety from France. Fruit medium to large, yellowish white. Bunches short.

Bertin Seedling.—Appears in the catalogue of the American Pomological Society for 1869.

Boston Lady.—A white variety.—Gar. Month. 1860: 250.

Bronze.—Mentioned in Hovey's Magazine for 1861, p. 101.

Buist Long-bunched.—Originated by Robert Buist of Philadelphia, Pa. Fruit similar to Red Dutch in flavor. Bunches long and tapering. Leaves large and very thick.

Caywood Seedling.—A seedling received at the Geneva (N. Y.) Experiment Station from A. J. Caywood & Son, of Marlboro, N. Y. Described as a moderate grower, with spreading or drooping branches, very productive. Fruit more acid than the White Grape, of good quality, attractive, translucent, tinged with pale greenish yellow. Bunches of medium size, about two and one-half inches long. Berries large.

Champagne (Pheasant's Eye, Groseillier à Fruit Couleur de Chair). —Of foreign origin. Fruit large, acid, delicate reddish pink, like a cross between the red and white, though the wood, foliage, and growth place it among the reds.

Champion.—A white variety, with berries a shade lighter than

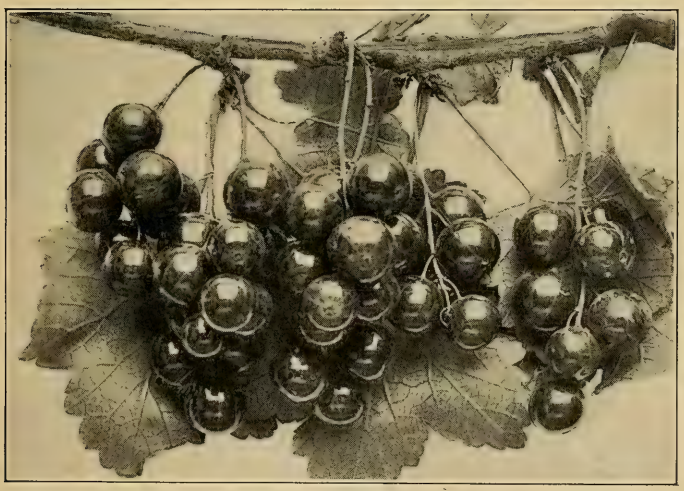

Plate XI. Two good currants.—Chautauqua above; Diploma below.

White Dutch and inferior to it in appearance, flavor, and quality.—Geneva (N. Y.) Exp. Sta. Bull. 95: 427.

Chautaugua (Climbing).—Found in the woods by R. F. Lonnen, Mayville, N. Y., about 1893. Introduced by The Curtice Nursery Company about 1902. Plants large, vigorous, upright-spreading, healthy and very productive. Stems unusually long, free from berries at the base. Fruit of good size, light red, of high quality, and hanging well after ripening. One of the most promising varieties at the Geneva, N. Y., Experiment Station. The tall spreading growth of the plants led to its being introduced as a climbing currant. It can be trained to a trellis if desired. Plate XI.

Cherry.—Obtained from Italy by M. Adrienne Seneclause, a distinguished horticulturist of France. He received it among a lot of other currants known there under the name *Ribes acerifolium.* He gave it the name owing to the size of the fruit. It was fruited at the Museum of Natural History in 1843, and from the plants there grown was figured in the "Annales de Flore et de Pomone" for Feb. 1844. (Roe says 1848.) It was brought to the notice of fruit-growers in the United States by Dr. William W. Valk, of Flushing, L. I., in 1846.[1] It was figured in the Horticulturist as a frontispiece to the volume for 1854; also in Hovey's Magazine, 1855, p. 425. A popular well-known variety largely planted both for market and home use. Described as vigorous, stocky, and compact when young, but becoming spreading with age, not suckering as freely as other kinds. Fruit borne in short-stemmed clusters close to the wood, which renders it somewhat difficult to pick. Fruit averaging large, though not uniformly so, juicy, and fine flavored. Color bright red.

Comet.—A British variety so nearly like Fay as to be practically identical, if not the same. Said to have originated in Guernsey.

Dana White.—A white variety raised in Massachusetts. Fuller says that he obtained, from what he supposed to be a reliable source five distinct varieties under this name.

Diploma.—Originated by Jacob Moore of Brighton, N. Y., from seeds of Cherry crossed with White Grape, sown in 1885. Introduced by Charles A. Green in 1906. Plant vigorous, upright, productive, bearing long clusters. Fruit light red, more transparent than other

[1] Horticulturist, 1: 439.

red varieties, seeds large and numerous, flavor mild. Fruit juicy, demanding careful handling. Plate XI.

Dr. Brete.—A French variety imported and cultivated by William S. Carpenter. Illustrated with a full page engraving in the Horticulturist for 1870, p. 45.

Eclipse.—Received at the Geneva (N. Y.) Experiment Station from H. S. Anderson, of Union Springs, N. Y. Described as vigorous, upright, with bunches of medium length. Fruit varying in size, with heavy juice, good for jellies.

Empire.—Reported as lacking hardiness and productiveness at the Virginia Experiment Station. Fruit large, bright ruby-red but stems short.

Fay.—Said to be a seedling of Cherry or Victoria, which originated in 1868 with Lincoln Fay, in Chautauqua county, N. Y. It was introduced about 1883. Vigorous, though somewhat spreading, with the lower branches often trailing on the ground. Clusters long, with a good stem between the branch and the fruit, making it easy to gather. Fruit varying from medium to large, uniform in size, of good quality, darker than Red Dutch.

Filler.—Originated in Ulster County, N. Y. A favorite about Marlboro, N. Y. Described as a strong grower but with a very sprawling growth, many branches lying on the ground. Clusters compact and large, easy to pick but hanging well on the bushes. Fruit large, attractive and rich; plant productive. Believed by some to be the same as Fay. It is offered by W. N. Scarff of Ohio under the name Scarff.

Franco-German.—Healthy, productive, bearing very large clusters and holding its fruit late in the fall.

Gloire de Sablons.—Fruit small, white, striped or splashed with red.

Gloucester Red. Described in Tilton's Journal of Horticulture for 1871, p. 188.

Gondoin Red (Red Provence).—Said to have been named from the town in France where it originated. By some this is regarded as the same as Red Provence, and is apparently mentioned by Prince under this name in the Horticulturist, Vol. 2, p. 266. In the Gardener's Monthly for 1876, p. 209, the editor, Thomas Meehan,

mentions Raby Castle, May's Victoria, and Imperiale Rouge as synonyms.

Holland (Long-Bunched Holland) (Long-Bunched Red [?], Red Dutch Long-Bunched [?]).—A popular variety in many parts of the West. Described as an upright grower, the young wood reddish in color; productive; ripening late, somewhat resembling Victoria. Retains its foliage and fruit later in the season than most varieties.

Imperial Yellow (Imperiale Jaune, White Imperial).—Said to be practically identical with White Grape.

Indiana.—Introduced by J. E. Shideler, of Indianapolis, Ind.

Knight Early Red.—A variety originated by Thomas Andrew Knight, of England.

Knight Large Red.—Another of Mr. Knight's seedlings. Described as large, bright red, bunches large, and productive.

Knight Sweet Red.—Described as large, dark red, bunch long, tapering. Similar in quality to the Red Dutch.

La Hative (Hative de Bertin, La Fertile).—A French variety mentioned by Downing as a failure. In the Gardener's Monthly for 1876, p. 209, the editor, Thomas Meehan, gives this as a synonym of Red Dutch.

Lakewood.—A new red variety on trial in Michigan. Said to be a good grower, but not productive.—Mich. Exp. Sta. Bull. 118: 20.

London Market.—Mentioned as an English variety imported in 1878; somewhat resembling Fay, though more delicate in texture, with seeds large and numerous.—U. S. Dept. Agr. Rept. 1891: 395.

London Red (Short-Bunched Red).—Clusters with a very short stem. Fruit similar to Red Dutch in quality and color.—Geneva (N. Y.) Exp. Sta. Bull. 95: 418.

Magnum Bonum.—Mentioned.—Horticulturist, 1854: 11.

Marvin Seedling.—Received at the Geneva (N. Y.) Experiment Station from D. S. Marvin, of Watertown, N. Y. Described as moderately vigorous, and upright. Fruit one of the largest of the white currants. Resembles White Grape in color, but more acid. Controlled by J. C. Vaughan, of Chicago.—N. Y. Exp. Sta. Bull. 95: 427.

Mills Nos. 20, 22, 28 and 29. On trial at the Geneva (N. Y.)

Experiment Station at one time. Received from Charles Mills, of Fairmount, N. Y. Said to be seedlings of the Versaillaise crossed by Red Dutch.

North Star.—An accidental seedling, introduced by the Jewell Nursery Company of Lake City, Minn. Described as vigorous, upright, or somewhat spreading. Bunches of medium length. Fruit much like Red Dutch, variable in size.

Palluau (Fertile de Palluau).—Mentioned by Downing and Fuller as a French variety of vigorous, upright growth, and productive. Fruit large, bright red, resembling Red Dutch. Thomas Meehan [1] gives this as a synonym of Red Dutch.

Palmer Sweet Red.—Mentioned in the Horticulturist for 1824, p. 161, as a fine, long-bunched, large-berried variety of vigorous growth, and productive.

Perfection.—Originated by Chas. G. Hooker, Rochester, N. Y., in 1887, by crossing White Grape and Fay. Introduced by C. M. Hooker & Sons, in 1902. Intermediate between its parents in character of plant. Fruit borne along old wood like White Grape, excelling Fay in size of both cluster and berry, large to the tip, with good length of stem at base. Color bright red, flavor and quality excellent.

Pitmaston Sweet Red.—Mentioned in the same place as the sweetest of all red currants, having short bunches, and small fruit. Said to have been raised by Mr. Williams, of Pitmaston.

Pomona.—Introduced by Albertson & Hobbs, of Bridgeport, Indiana. Vigorous, productive; fruit medium to large, bright red, sweet and excellent, hanging for a long time after ripening. A dependable variety.

Prince Albert.—Described as vigorous, more upright than Red Dutch, and a very heavy yielder, though a weak grower when young. Bunches short to medium. Fruit medium to large, rather pale red, of poor quality, ripening late. Profitable and popular at canneries.

Purity.—Plant low-growing and sprawling. Fruit yellowish white.

Red Cross.—Originated by Jacob Moore, of Attica, N. Y. A cross between Cherry and White Grape. Vigorous and upright,

[1] Gar. Month. 1876: 209.

clusters large and easily picked; fruit medium to large, lighter, milder and somewhat later than Cherry. Introduced by Green's Nursery Company.

Red Dutch (Large-Bunched Red, Long-Bunched Red, Morgan's Red, Groseillier Rouge à Grosse Fruit).—Meehan [1] also gives the following list as synonyms of this variety: Fertile, Fertile d'Angleterre, Fertile de Palluau, Fertile de Bertin, La Hative, Hative de Bertin, Bertin No. 9, Belle de St. Gilles, Chenonceaux, Grosse Rouge de Boulogne, Queen Victoria, and Red Grape. One of the oldest and best known varieties. It is still retained by some growers in the West, and perhaps elsewhere. A strong grower, rather tall, upright, with comparatively slender shoots, productive. Fruit of fine color and sprightly flavor, but not large.

Red Grape.—Mentioned by Fuller as having foliage not shining, as with the Red Dutch.

Ruby.—Raised by Jacob Moore, the originator of the Brighton Grape, from seed of the Cherry believed to have been crossed by White Grape. Described as not equal to Versaillaise or Cherry in size, but with larger bunches and better fruit; productive. Excellent in some localities.

Scarlet Gem.—Plant low-growing and coarse; fruit small, pleasant, pinkish white.

Select.—Said by T. T. Lyon to lack in vigor and productiveness.—Mich. Exp. Sta. Bull. 118: 20.

Short-Bunched Red.—Mentioned by Downing as much like Red Dutch, with shorter bunches.

Silver-Mine.—Offered by the Gardner Nursery Company of Iowa, Described as prolific, large, red, of fine flavor, holding its leaves and fruit very late.

Stewart ('s Seedling).—A Minnesota variety, mentioned as not having received its share of notice. Said to be the handsomest in bush and berry of any variety grown in that state. Vigorous, upright, prolific and hardy. Fruit somewhat hidden by the leaves, large, borne in good sized bunches, remaining a long time after ripening without injury.—Ann. Rept. Minn. Exp. Sta. 1888: 235.

Striped Fruited (Silver Striped).—An old German variety. Men-

[1] Gar. Month. 1876: 209.

tioned by Downing and Fuller as being distinctly striped, but small, a poor bearer, and of no value except as a curiosity.

Transparent (Transparent White, Transparent Blanc).—A French variety mentioned by Downing and Fuller. Said to be a seedling of the White Grape, and to resemble that variety so closely as to be practically identical.

Versaillaise (*La*) (Versailles, Macrocarpa, Fertile d'Angers, La Caucase, Caucasian). Originated by M. Bertin, of Versailles, from seed of the Cherry currant, and similar to that variety. This is one of the best known market currants, and very generally prized. E. P. Powell says [1] that the true Versaillaise is not unlike Fay in size and color, a rather more upright grower, with a long, fine stem, enormously productive. Flavor almost like Fay.

Victoria (May's Victoria, Goliath, Raby Castle, Red Grape, Houghton Castle, Wilmot's Red Grape). Said to have been known in Hexham and New Castle as the Houghton Castle currant. Sent from there to Raby Castle, whence it was procured by Mr. May, of Leaming Lane, and advertised by him as May's Victoria. One of the most reliable red currants known. A very strong grower, upright, very productive. Foliage rather pale green. Fruit bright red, medium or above in size, mildly acid, late in coloring, but will keep on the bushes in good condition later than either Cherry or Red Dutch. Less liable to attacks of the currant borer than most other sorts. Victoria, Holland and Prince Albert seem to belong to a somewhat distinct class, being able to retain their leaves and fruit better than most sorts.

Warner's Red Grape, Warrior's Grape.—English varieties mentioned in Tilton's Journal of Horticulture, Vol. 9, p. 188. Perhaps synonyms of other sorts.

White Dutch (White Crystal, White Clinton, Reeves' White, Morgan's White, White Antwerp, White Leghorn, Clarke's Sweet, White Holland, White Pearl). Very similar to Red Dutch in habit. Bush vigorous, upright and productive. Fruit variable in size, translucent, slightly darker than White Grape, mildly acid; quality excellent, very rich and sweet. A well-known old sort.

White Grape (White Antwerp, Imperial White [?], Imperial Blanc).

[1] Garden and Forest 7: 188.

—Probably the best known and finest white currant grown. Described as moderately vigorous, rather slender, somewhat spreading, productive. Bunches long, berries quite uniformly large, translucent, whitish, attractive, mild in flavor and of fine quality. E. P. Powell says [1] that it was long before he secured the genuine White Grape. This he considers to be absolutely the finest white currant grown. The fruit is large, handsome, clear in color, entirely unlike the creamy color of the more common so-called white currants.

White Imperial.—A variety strongly recommended by S. D. Willard, of Geneva, N. Y. Said to be by far the sweetest currant known, the difference in that respect being like that of the sweet and sour cherry. Clusters and berries of good size.

White Pearl.—Mentioned and described, in Hovey's Magazine, Vol. 17, p. 217, as raised by Remi Wilquet near Brussels. Perhaps not introduced in America. Fuller gives this name as a synonym of White Dutch.

White Provence.—Mentioned by Downing, Prince, and Fuller. Said to be strong, upright, with leaves more or less silvered at the edge. Fruit large, yellowish white.

White Versaillaise.—Said to have been raised by M. Bertin, of Versailles, France. Vigorous, upright, easily picked. Bunches long; berries large, slightly darker than White Grape.

Wilder.—A seedling of the Versaillaise which originated in the seventies with E. Y. Teas, of Irvington, Ind., who named and disseminated it to a limited extent. Later the stock was sold to S. D. Willard, of Geneva, N. Y., who catalogued it as "President Wilder." Said by him to be the most productive currant which he had tried. Described as vigorous, upright. Fruit large, but not so uniform as Fay, of fine color, lighter than Fay, remaining bright and attractive until very late in the season. Flavor mild, quality good. Demands heavy pruning. A reliable variety.

[1] Garden and Forest 7: 188.

EUROPEAN BLACK CURRANTS

(*Ribes nigrum*)

Baldwin.—Described as moderately vigorous and productive. Flavor milder than that of the Common Black.

Bang Up.—Mentioned by Downing as a variety similar, and in no way superior, to the Black English.

Fig. 42. Black Naples currant.

Black Grape (Odgen's Black Grape).—A vigorous grower, but unproductive. Fruit variable, strong flavored.

Black Naples. (Fig. 42).—One of the best known English sorts. Vigorous, moderately productive. Fruit variable, strong flavored.

Black Victoria.—Growing at the Geneva, N. Y., Experiment Station.

Booskoop Giant.—A black currant from Holland. Vigorous and

productive. Fruit suitable for preserving, very large, hanging for a long time on the bushes.

Brown-Fruited (Green-Fruited, Russian Green).—An English variety having greenish brown fruit when ripe. Berries dry, hard, rank flavored and worthless.

Champion. — Described as of dwarf, upright habit, fairly productive. Fruit of large size, borne in short clusters, mild flavored.

Common Black (Black English).—Described as vigorous and productive, of spreading habit. Fruit medium to large, the clusters ripening evenly. Pulp rather acid and strong flavored.

Dwarf Black.—Mentioned in the Horticulturist for 1854, p. 162, as of more dwarf habit than the other blacks.

Lee (Lee's Prolific).—Bush dwarfish, moderately vigorous, productive. Fruit bright, but not much better than Black Naples.

Fig. 43. *Ribes americanum* (×½).

Prince of Wales.—Origin Ontario. Bush vigorous and productive, giving the highest yield of all black currants at Geneva, N. Y. Fruit variable in size, milder in flavor than the Common Black, nearly sweet when fully ripe.

Saunders.—Originated by William Saunders, of Ontario. Described as vigorous and productive. Variable in size, rather mild. Fairly well disseminated and promising in Canada.

THE GOLDEN OR BUFFALO CURRANT

(*Ribes odoratum*)

Crandall.—The best known variety of this species, although the plants sent out under that name differ so much that they are supposed to have been only seedlings. Like the forms found in unnumbered door-yards, known as the Flowering Currant, this is a tall, vigorous, upright bush. Although apparently productive, the average yield per bush at the Geneva (N. Y.) Experiment Station for three years was less than one pound. The fruit has a tough skin and such a peculiar flavor that it is little prized.

Deseret.—Another named variety of this species. Mentioned by Fuller, who says it was highly valued by the Mormons of Salt Lake City, whence he received it.

Golden.—Apparently a variety of the western representative of this species, (*Ribes aureum*), since it is described by Fuller as "large, round, deep golden yellow, very acid, and slightly bitter. Flowers yellow. Of no value for its fruit, but might be improved. Native of the Rocky Mountains and a variety of *Ribes aureum.*"

Jelly.—Received at the Geneva (N. Y.) Experiment Station from R. H. Blair & Company, Kansas City, Mo., being selected plants of this species obtained in western Kansas. Found to be of larger size and more productive than Crandall.

This species has often been known under the name Missouri Currant. It has also appeared at times under other names, such as Utah, Utah Hybrid, etc.

THE AMERICAN BLACK CURRANT (FIG. 43)

(*Ribes americanum*)

This species is almost unknown in cultivation, yet Fuller mentions one variety under the name Sweet-fruited Missouri, which he describes as large, black, roundish ovoid. Bunches small, containing

few berries of sweet, musky flavor. He says that it is a slight improvement upon the common wild black currant, which may be found in almost any low, moist woods. The species is being used as a basis for plant-breeding work in the Northwest.

RECOMMENDED VARIETIES OF CURRANTS

The Cherry currant is still considered one of the most desirable large-fruited varieties. Fay is preferred in some localities, having longer bunches, more easily picked, and being more uniform is size, but inferior in yield and in habit of growth. Victoria, Prince Albert and Wilder are good late varieties, remaining in good condition for shipping longer than either Cherry or Fay. Chautauqua is one of the promising newer varieties. Prince Albert is one of the most productive, and popular for jelly. Victoria is only medium in size. White Imperial and White Grape are good white varieties, though white currants are little grown. Prince of Wales is a productive black variety.

CHAPTER XIV

VARIETIES OF GOOSEBERRIES

The gooseberries cultivated for fruit belong to two distinct types, the European and the American. The former are representatives of the species known as *Ribes Grossularia*, Linn. (Fig. 44). The botanical origin of the American type is somewhat confused. Formerly it was thought that *R. oxyacanthoides*, Linn., is the parent of nearly all our cultivated varieties. But it was the eastern form of this type, now given the specific name *R. hirtellum*, that is chiefly involved. Several of our best-known varieties, such as Downing and Houghton, are considered to be hybrids between this and the European type.

Fig. 44. *Ribes Grossularia* (×1).

One or two other native species are already represented or are being used by plant-breeders in the development of varieties suited to particular regions.

Ribes Cynosbati, Linn., the prickly-fruited eastern gooseberry has played little part in the development of American

varieties, the variety Mountain being the only one of prominence known to have been derived in part from this species. The prickly character of the fruit is against it, but smooth-fruited forms occur and the fruit is larger than that of *R. hirtellum.*

Ribes setosum, Lindl. and *R. inerme,* Rydb. are believed to be sparingly represented in cultivation. The former appears to be a gradation species of a series beginning with *R. hirtellum* in the East, *R. oxyacanthoides* of the Plains, *R. setosum,* from northwestern Nebraska west and northward and *R. irriguum,* of the Pacific slope.

Fig. 45. *Ribes missouriense* (×⅔).

Ribes missouriense, Nutt., the fragile-flowered gooseberry of the Plains, more commonly known as *R. gracile* (Fig. 45), is a promising species for that region and has been largely used in plant-breeding work at the South Dakota Experiment Station in seeking to develop varieties better adapted to the northern Plains region. This species and the form commonly known as *R. rotundifolium* have also been used by W. F. Vanfleet in producing hybrids in the East, with promising results. ("Rural New Yorker", 1907: 622.)

The European species (*Ribes Grossularia*) has been long

in cultivation and its fruit greatly improved, at least in size and appearance, while the American, being young in cultivation, is far behind in size, though superior in quality. The English varieties all have a thick, rough skin, that detracts from their value, and they are even more sour than our own. The susceptibility of English varieties to mildew, which has been the chief cause of their failure in the United States, is really the most prominent distinction between the two species at the present time. The European type is essentially a stocky and close grower whereas the American type is a slender and open grower. Plate XII.

HISTORY AND FUTURE

Like the currant, the gooseberry appears not to have been known to the ancients, and it is uncertain when it first began to receive garden culture. Although long common among the hedges and woods of England, it is thought by most authors not to have been indigenous. It is reported, as first mentioned by British authors, about the beginning of the sixteenth century. Geo. W. Johnson [1] states that Tusser, in his "Five Hundred Points of Good Husbandry," published during 1557, mentions the gooseberry as then among garden fruits. Johnson's edition of Gerarde's "Herbal," published in 1636, says: "There be divers sorts of the gooseberries, some greater, others lesse; some round, others long, and some of a red color. . . . The sorts of gooseberries are these: the long greene, the great yellowish, the blew, the great round red,

[1] The Cucumber and Gooseberry, p. 103.

Industry, the European type.

Pale Red, the American type.

Plate XII. Two types of gooseberry.

the long red, and the prickly gooseberry." The further statement is made that "These plants doe grow in London gardens and elsewhere in great abundance." Under the heading of names, the statement is that "this shrub hath no name among old Writers, who as we deeme knew it not, or else esteemed it not; the later writers call it in Latine, Grossularia, and oftentimes of the berries, *Uva Crispa, Uva spina, Uva spinella,* and *Uva Crispina;* in French, Groiselles; in English, Gooseberry, Gooseberry bush and Fea-berry bush in Cheshire, my native country." This latter name was also known in other parts of England, being abbreviated into Feabes or Fapes in some localities. Most authors have thought that the name gooseberry was derived from the fruit having been first used as a sauce with "green goose." Others doubt this. Geo. W. Johnson [1] says: "It is somewhat unfortunate for this derivation that it has never been so used. It seems to me more probable to be a corruption of the Dutch name Kruisbes, or Gruisbes. Kruisbes, I believe, was derived from Kruis, the Cross, and Bes, as Berry, because the fruit was ready for use just after the Festival of the Invention of the Holy Cross; just as Kruis-haring, in Dutch, is a herring caught after the same festival." [2]

Loudon states [3] that the first marked improvement in size was made by the Dutch. But its present remarkable development has been brought about largely by the efforts

[1] The Cucumber and Gooseberry , p. 109.

[2] An excellent early account of the gooseberries, with colored plates, is Thory's "Monographie on histoire naturelle du genre Groseillier," Paris, 1829.—L. H. B.

[3] Arboretum et Fruiticetum, 2: 973.

of the Lancashire weavers. The production of new varieties, and the increase in size, has been greatly stimulated by the annual shows or "gooseberry prize meetings," at which liberal prizes are offered for the largest fruits. The results of these are published in the "Gooseberry Annual," now forming an extensive set. At the beginning of the century the largest fruits seldom exceeded 10 dwts. in weight, but in recent years they frequently exceed 30 dwts. Size is not the only quality sought; some sorts are prized for their flavor, some for their beauty, and others for their productiveness. There is also a wide diversity in the season of ripening among different sorts.

The history of the American gooseberry in cultivation began with the Houghton, which was raised from seed of a wild plant by Abel Houghton, of Lynn, Massachusetts, in 1833. It is significant that the most reliable American sort, and the one most generally cultivated at the present time, is but one generation removed from this, being a seedling of it.

What the gooseberry of the future will be no one can say, but it is certain to be largely what we make it. It seems safe to predict that it will not come from England. Adaptability to climate, with consequent resistance to disease, and quality of the fruit, are in favor of American species. We have given the gooseberry too little attention, and much of that has been on the wrong basis in trying to develop seedlings of the English varieties. The gooseberry as now grown is objectionable on account of its thorns. Yet there are forms comparatively free from these uncomfortable additions, and careful, persuasive treatment ought to induce the plants to relinquish them

altogether. An English variety has been recently introduced which is said to be thornless. The fruit of our species is, in most cases, perfectly smooth, while that of the English gooseberry is roughly pubescent, if not hairy or prickly also.

THE KINDS OF GOOSEBERRIES

In the following list of varieties those known to be of foreign parentage are designated by the letter (F), those believed to carry an admixture of both types are marked by the letter (H).

Apex.—A variety from Oregon. Said to be a native seedling, though somewhat resembling the European type in growth and general appearance.—T. T. Lyon, Mich. Exp. Sta. Bull. 118: 23.

Blucher (F).—Very large, dark red, oblong or roundish oblong, nearly smooth,[1] with thin skin, sweet, of very good flavor. Bush a strong grower, apparently productive, with but little mildew.

Careless (F).—Succeeds at the New York Experiment Station.

Carman.—Described as large golden yellow, very hardy and remarkably free from mildew.

Carrie.—Origin Minnesota. Vigorous, hardy, with an abundance of leaves, free from mildew and anthracnose, nearly thornless. Fruit larger than Houghton, turning a deep maroon when ripe, flavor excellent.

Cedar Hill (H).—A variety mentioned in the report of the U. S. Pomologist for 1891, p. 394, as received from Dr. A. W. Thornton, West Ferndale, Washington, with whom it originated. Described as large, oval, with long, adhering flower parts, and a few scattering

[1] The term "smooth," as used in describing English gooseberries, should be understood to mean free from hairs, for the skin of these varieties has a roughness to the touch quite different from that of the American varieties.

prickles. Said to be an upright grower, of good size, prolific. Mildew proof in Washington. Possibly a seedling of some western species.

Champion.—Said to have originated with O. Dickinson, Salem, Oregon. Plant upright, prolific. Fruit large, uniform, transparent, with tender skin. Said to endure neglect well, and to be an excellent shipper. Popular in Indiana.

Chautauqua.—Origin unknown. It first came to notice in an old garden at Dunkirk, N. Y., having been obtained from a neighbor who had secured it from some other source. It was secured by Lewis Roesch, who introduced it in 1894. Although carrying European blood, if not a pure-bred European sort, the Chautauqua suffers but little from mildew, the greatest enemy of varieties of this type. The bush is stocky, upright, compact, with thick, dark shining leaves like other European varieties. Productive when well established. Fruit large, roundish-oval, silvery green, flesh green, firm and sweet. Freedom, Wellington Glory and Portage are other European sorts said to resemble Chautauqua. Plate XIII.

Columbus (F).—Introduced by Ellwanger & Barry, of Rochester, N. Y. A strong grower, comparatively free from mildew. Fruit large, oblong or roundish oblong, white or greenish yellow, sweet, of best quality. Possibly the same as Triumph, Plate XIII. A variety has been sold under this name which seemed to be the same as Chautauqua.

Crown Bob (F).—A variety long known in England as desirable either for home use or market. Bush dwarfish, but vigorous and productive. Fruit medium to large, nearly round, dark red, nearly smooth, almost sweet, of good quality, similar to Industry in color, but somewhat smaller; quite subject to mildew.

Crystal (H).—Received at the Geneva (N. Y.) Experiment Station from J. M. Ogle, of Puyallup, Wash. Professor Beach says [1] that this variety appears to be a hybrid between the European gooseberry and some American species, possibly *Ribes Cynosbati*, its European parentage being indicated by the general appearance and character of the fruit, which is pubescent, like the European varieties. Its canes are tall and slender, and the leaves thin. Very productive, but hardly desirable, owing to its dull green color and poor flavor.

[1] Geneva, N. Y., Expt. Sta. Bull. 114:16.

Plate XIII. Gooseberries. Chautauqua above; Columbus below.

Dominion (F).—Received at the Geneva (N. Y.) Experiment Station from E. C. Pierson of Waterloo, N. Y. Described as vigorous and promising. Fruit large, pale greenish white.

Downing (H).—The Great American gooseberry. More widely grown and more generally prized than any other sort. Originated by Charles Downing at Newburg, N. Y., from seed of the Houghton. Pure seedlings of this variety grown at the Geneva (N. Y.) Experiment Station, while not generally closely resembling the parent, seem, in some cases, to indicate a mixture of foreign blood, so that Professor Beach is led to consider this a hybrid between the American and European gooseberry. Downing describes it as upright, vigorous and productive. Fruit somewhat larger than Houghton, roundish oval, whitish green, with the rib-veins distinct. Skin smooth; flesh rather soft, juicy, very good. Excellent for family use. It has seldom mildewed in the United States, and succeeds over a wide area. Houghton is said to be sometimes sold for this variety because more easily propagated. The fruit must be picked very soon after reaching full size, for it ripens quickly and becomes too soft for handling or shipment. In quality it is superior to the European varieties, and surpassed by few, if any, native sorts.

Duke of Sutherland (F).—Succeeds in New York State.

Excellent (F).—Promising at the Geneva (N. Y.) Experiment Station. A strong grower, somewhat subject to mildew. Fruit medium to large, round and nearly smooth, light red, sweet, very good.

Excelsior.—Received at the Geneva (N. Y.) Experiment Station from J. H. Haynes, of Delphi, Indiana, with whom it originated. A strong grower; fruit light green, roundish, smooth.

Freedom (F).—A promising early variety.

Frontenac (F).—Received at the Geneva (N. Y.) Experiment Station from H. S. Anderson, of Union Springs, N. Y. Fruit large, oblong, smooth, pale green, sweet, good.

Gipsy Queen (F).—Late. Succeeds in New York.

Golden Prolific.—Moderately vigorous; foliage rather susceptible to disease. Fruit very large, elongate, yellowish ground color, washed with reddish purple on exposed cheek, skin very thick and tough, flavor poor but sweet when ripe.

Gracilla (F).—Mentioned in The Rural New-Yorker, 1897, p. 646, as a promising variety of the English type received from L. H. Hoysradt, Pine Plains, N. Y., in the spring of 1895.

Hale Golden (H).—Mentioned in The Rural New-Yorker, 1897, p. 646, as on trial at the Rural grounds.

Hedgehog (Improved Early) (F).—A vigorous grower, productive, comparatively free from mildew. Fruit below medium size, nearly round, somewhat hairy, yellowish green.

Hobbs Seedling.—Mentioned by Downing. Thought to have been originated by O. J. Hobbs, of Randolph, Pa. Described as light pale green, nearly one-half larger than Houghton.

Houghton (H).—Grown from seed in 1833 by Abel Houghton, of Lynn, Mass., who planted Crown Bob, White Smith, White Rock and Red Champion, with a native plant from the woods in the center. One plant only was saved, the Houghton. This was the first American variety introduced, and is still one of the best flavored, most hardy and productive, though too small. It is generally regarded as a pure native, but the account of its origin, and experiments made at Geneva, N. Y., by growing seedlings from two of its seedlings, Smith and Downing, indicate that it is a hybrid between the American and European species. The bush is rather slender and drooping in habit. The fruit small, handsome, dark red, with a whitish bloom, thin skinned, smooth, juicy, sweet, and of excellent quality.

Hudson.—Raised by Joseph H. Ricketts, and said to be of fine quality, larger than Downing, free from mildew. Foliage thick and glossy. Thought to be an American or a cross-bred variety. Hard to propagate.

Huntsman.—Said to be a strong grower, and apparently productive, comparatively free from mildew. Fruit medium to large, oblong, smooth, pale green, sweet, good.

Industry (Whinham's Industry) (F).—First grown by Robert Wyndham in northern England early in the nineteenth century. Disseminated in this country by Ellwanger & Barry, about 1885. One of the best known and generally successful European varieties. Vigorous, productive, somewhat subject to mildew. Fruit medium to large, varying from pear shape to roundish oblong, smooth, or

Plate XIV. Industry. The most prominent European-type gooseberry in the United States.

with very few minute prickles, dark red, mild subacid or sweet, of good flavor. Said to be very hard to propagate in the United States. Plates XI and XIV.

Jewett.—Received at the United States Division of Pomology from George H. Andrews, Clarkson, N. Y. Found in a pasture. Described as large, oblong, whitish green, changing to blotched and stippled red. Rep. U. S. Pomologist 1894: 27.

Jolly Angler (F).—Vigorous, and apparently productive. Fruit medium to large, oblong or roundish oblong, smooth, light green, sweet, good.

Keepsake (F).—A strong grower, promising to be productive, somewhat subject to mildew. Fruit medium or above, nearly round, smooth, greenish white, sweet or nearly so, very good.

Lady Popham (F).—A moderate grower, productive, comparatively free from mildew. Fruit medium to large, oblong, smooth, yellow, very sweet, good. A good variety for exhibition purposes.

Lancashire Lad (F).—A strong grower, comparatively free from mildew. Fruit medium to large, nearly round, dark red, almost wine color, slightly hairy, of good quality, subacid or nearly sweet.

Leveller (F).—A moderate grower, mildewing but slightly, and promising to be productive. Fruit medium to large, oblong, smooth, yellowish, slightly acid, good.

Lord Beaconsfield (F).—A good grower, promising to be productive, somewhat subject to mildew. Fruit below medium size, nearly round, green, smooth, sweet and good.

Matchless (F).—A strong grower, promising to be productive, mildewing but slightly. Fruit large, oblong, green, slightly hairy, sweet, very good.

May Duke (F).—One of the successful early foreign sorts at the Geneva, N. Y., Experiment Station.

Mountain (H).—A variety which originated with the Shakers, of Lebanon, N. Y. Bush tall and productive, with slender, sprawling branches, which need close pruning. Fruit dull, brownish purple, somewhat larger than Downing, oblong, smooth, with a thick skin, moderately juicy and sweet. Professor S. A. Beach says [1] that this variety is of special interest, as being the only known representative

[1] Geneva (N. Y.) Exp. Sta. Bull. 114: 18.

of *Ribes Cynosbati* which has found its way into cultivation, being clearly a hybrid between this and a European species. The long, slender, solitary spines, the tall canes, sprawling branches, dull brown purplish color of the fruit, and the very dark green pulp are like Cynosbati, as are also the beautiful brown and red color of its autumn foliage which is quite unlike the yellow or occasional brown tints of the European kinds. The fruit is very large for an American variety, and its thick, smooth skin indicates foreign parentage, the fruit of Cynosbati having a thin skin usually beset with prickles. The glossy upper surface, and somewhat leathery texture of the foliage, and comparative short, thick buds are also inherited from the European parent, Cynosbati having slender buds, with soft, pubescent leaves, neither leathery nor glossy.

Newell Seedling (H).—A variety mentioned in the Report of the Illinois Horticulture Society for 1890, p. 59, as on exhibition in a preserving solution. Said to be large, of fine appearance, hardy, and free from mildew.

Orange (Engle's Yellow?).—Said to ripen seven to ten days earlier than other sorts. Fruit about the size of Houghton, rich golden yellow, fine flavored and very sweet.

Oregon Jumbo (H).—A variety offered by the J. T. Lovett Company, of New Jersey, and described as "monstrous, and excelling all others. Superb in appearance and flavor. Vigorous, productive, hardy, and reliable. Fruit smooth, pale green, of high quality."

Pale Red (American Red, American Seedling, Robert's Sweetwater, Ohio Seedling, Dutch Joe, Ohio Prolific, St. Clair [American] Cluster.)—A variety of unknown origin which has long been in cultivation. Frequently known as Cluster or American Cluster. It appears to be of pure *Ribes hirtellum* parentage. The bush is a strong grower, with slender wood, very productive. Fruit small or medium, darker in color than Houghton, tender, sweet and good. One of the oldest cultivated varieties.

Pearl (H).—Originated with Professor William Saunders, of London, Ont., who gives its parentage as Downing crossed with an English variety known as Aston's Seedling, which is apparently a synonym of Red Warrington. The variety resembles Downing very closely, both in bush and fruit.

Poorman.—Originated along about 1888 with William H. Craighead, Brigham City, Utah; introduced by D. S. Lohr, Trementon, Utah, in 1896. Said to be a cross between Houghton and Downing, which the bush and fruit indicate to be true. Plants so large and vigorous that they must be set farther apart than other varieties; upright-spreading, very productive, not susceptible to mildew. Fruit larger than either parent, measuring over an inch long and nearly an inch through, oval, pinkish red when ripe, quality excellent. Considered the best of sixty-two varieties grown at the Geneva, N. Y., Experiment Station.

Portage (F).—A variety received at the United States Division of Pomology from A. H. House, Mantua Station, Ohio. Described in the report for 1891, p. 395. Also described, and illustrated by a colored plate, in the report for 1894. Said to be a chance seedling found in 1874. Fruit solitary, evenly distributed, large to very large, oblong oval; surface moderately smooth, dull, slightly downy, with an occasional prickle. Color yellowish green, with bronze dots near stem, and a long suture on some specimens. Flesh translucent, greenish, quite firm; pulp melting, moderately juicy. A good shipper. Flavor mild subacid, rich, quality good.

Puyallup (Puyallup Mammoth) (F).—The original bush is said to have been dug in 1881, at an old Indian camp on the bank of the Puyallup River, one mile below the town of that name, by W. M. Lee and his wife, of Tacoma, Wash. Introduced by J. M. Ogle, in 1887. Said to be a fairly strong grower, rather late in ripening. Fruit large, pale green, smooth, sweet, of good quality. Mentioned in the Report of the U. S. Pomologist for 1891, p. 395, as apparently identical with Triumph, but Professor Beach considers this an error.

Queen of the Whites (F).—A strong grower, comparatively free from mildew. Fruit of medium size, nearly round, smooth, pale yellowish green, sweet, good.

Red Champagne (F).—A strong grower, comparatively free from mildew. Fruit small to medium, nearly round, slightly hairy, dark red, sweet, and good. This variety was recommended by the American Pomological Society in 1850.

Red Jacket (H).—A variety originated many years ago by Professor William Saunders, of London, Ont. Named and introduced

by George S. Josselyn, of Fredonia, N. Y., who thinks that it was a seedling of Houghton crossed by Red Warrington. It is a strong grower, productive, and a good shipper. The fruit is large, roundish or elongated, reddish green shading into red, smooth, quite transparent when ripe; skin rather tender. Flesh juicy, rich, fragrant, of good quality.

Red Jacket (F).—An English variety, entirely distinct from the American Red Jacket. Not a strong grower, but promising to be productive and comparatively free from mildew. Fruit large to very large, and often narrowed toward the stem.

Red Warrington (Aston Seedling) (F).—A strong grower, comparatively free from mildew. Fruit medium to large, oblong, delicate pale red, hairy, sweet, of best quality. Recommended by the American Pomological Society in 1850. Also mentioned in the Horticulturist, Vol. II, p. 341, as the best kind, both in Canada and in England. Said to ripen late and to hang long on the bushes without injury.

Smith (H).—Originated by Dr. Smith, of Windsor, Vt., from seed of the Houghton. According to Professor Beach,[1] it shows indications of being a hybrid between the American and European species. Seedlings of Smith crossed with Pale Red, which is thought to be a pure American variety, have occasionally shown marked European characteristics, while none of the pure seedlings of Pale Red have ever given such indications. It is described as vigorous, with somewhat curving canes and slender branches. Fruit dull, pale green, sometimes spotted with red, and having a light bloom. Skin smooth, thin. Pulp sweet and good.

Smiling Beauty (F).—A good grower. Fruit medium to large, nearly round, greenish yellow, sweet, of best quality.

Spineless (F).—Recently introduced in the United States, by C. H. Joosten, of New York City. It is figured in the Gardener's Chronicle for July 27, 1895, which says: "They are spineless varieties obtained from seed. The first spineless gooseberry, according to the Revue Horticole, 1892: 180, was obtained as a chance seedling by M. Billard about 1860. About 1884, M. Ed. Lefort sowed the seeds of this variety, from which he obtained a race of spineless varieties,

[1] Bull. 114: 19.

several of which are described in the Revue Horticole, as above cited. The variety we figure is a dwarf form, very productive, and with fruit of good flavor. It is the form described and figured by M. Carrière and Madame Edouard Lefort. The varieties are grafted upon *Ribes aureum*, but the scions soon become free."

Stein (H).—Mentioned in The Rural New-Yorker, 1897, p. 646, as "a cross between Houghton and an old German variety."

Stockwell (F).—A moderate grower. Fruit medium to large, oblong, smooth, light green, sweet, good.

Strubler (H?).—Seedlings originated by Phil. Strubler, of Naperville, Ill., have been sent out under this name, with different numbers attached. Nearly all of them are seedlings of Downing or Smith. They are described by Professor Beach, in Bull. 114 of the Geneva (N. Y.) Experiment Station, and have also been mentioned in reports of the United States Pomologist.

Succeed (F).—A fair grower, promising to be productive, and comparatively free from mildew. Fruit medium to large, oblong, smooth, yellowish green, sweet, good.

Sulphur (Early Sulphur) (F).—A strong grower, comparatively free from mildew. Fruit of medium size, round, nearly smooth, fine yellow color, sweet, good. Placed on the list of the American Pomological Society in 1850.

Sunset (F).—A strong grower, comparatively free from mildew. Fruit medium to large, oblong, nearly smooth, yellowish green, sweet, of best quality.

Tally Ho (F).—A strong grower, comparatively free from mildew. Fruit medium to large, pear-shaped, pale green, nearly smooth, sweet, good.

Thumper (F).—A moderate grower, promising to be very productive. Fruit medium to large, oblong, smooth, light green, sweet, good.

Tree.—A variety mentioned by T. T. Lyon, in Mich. Exp. Sta. Bull. 118: 23, as apparently a native. Vigorous, healthy, with red fruit.

Triumph (F).—A strong grower, comparatively free from mildew, productive. Fruit large, oblong or roundish, pale yellow, sweet, smooth, good. This variety has received strong commendation from various sources. Mentioned at the meeting of the Western New

York Horticultural Society in 1892, as very promising, a stronger grower than Industry and equally productive. In the report of the American Pomological Society for 1889, p. 120, E. Williams says that it is a great improvement on any other variety that will grow in our climate.

Victoria.—Mentioned in the Gardener's Monthly for 1870, p. 156, as a small, smooth variety. Thorns not numerous, but sharp, inclined to bend over.

Wellington Glory (F).—The most productive European gooseberry grown at the Geneva (N. Y.) Experiment Station. A strong grower, comparatively free from mildew. Fruit attractive in appearance, medium to large, oblong, smooth, with slight bloom, pale yellow, nearly white, sweet, of very good quality.

White Eagle (F).—Bush a moderate grower, promising to be productive. Fruit medium to large, oblong, pear-shaped, smooth, greenish white, sweet, good. This variety was exhibited before the Pennsylvania Horticultural Society in 1853.

Whitesmith (Woodward's) (F).—A strong grower, somewhat subject to mildew, productive. Fruit medium to large, nearly round.

Gooseberry varieties in foreign lands are very numerous. Lindley's "Guide to the Orchard," published in 1830, enumerates nearly one thousand as already in cultivation at that time. Many of these as well as more recent introductions have found their way across the water at different times, usually only to soon disappear. In recent years considerable work with foreign sorts has been done at the Geneva, New York, Experiment Station. With better knowledge of how to control mildew some of them are proving valuable. The foreign varieties included in the foregoing list were largely chosen from those mentioned by S. A. Beach in Bulletin No. 114 of that Station.

No attempt has been made to include the many foreign varieties mentioned by Downing and others of the older

writers, nor those of recent days which have attained no prominence in American horticulture.

RECOMMENDED VARIETIES OF GOOSEBERRIES

The Downing is undoubtedly still the leading commercial gooseberry in the United States, though too small to be entirely satisfactory. In the foreign class Industry is best known and probably most generally successful. Among the newer sorts which are attaining prominence, Chautauqua, American Red Jacket and Poorman are worthy of especial mention.

ORNAMENTAL CURRANTS AND GOOSEBERRIES

The best known species in this role is the flowering currant, *Ribes odoratum* (Fig. 46), commonly known as *R. aureum*, so common in eastern gardens. This is a most attractive plant early in spring. It forms a graceful, drooping shrub, well adapted to masses or groups. In the early months of summer few plants are more attractive than this, regardless of its bloom, for its foliage is bright and glossy, and the form of the plant perfect. Yet before the middle of August its leaves are mostly gone. Were it not for this defect, few plants would deserve a higher rank for ornament.

The most showy plant of the genus is the fuchsia-flowered gooseberry, *Ribes speciosum*, of the Pacific coast (Fig. 47). Its flowers are long, bright red and handsome, and its foliage small, firm and glossy. It is a good plant for ornament, but is not hardy in the northern states.

A plant which has received much more attention for its flowering qualities is the red-flowered currant, *Ribes*

Fig. 46. *Ribes odoratum* (×1/2).

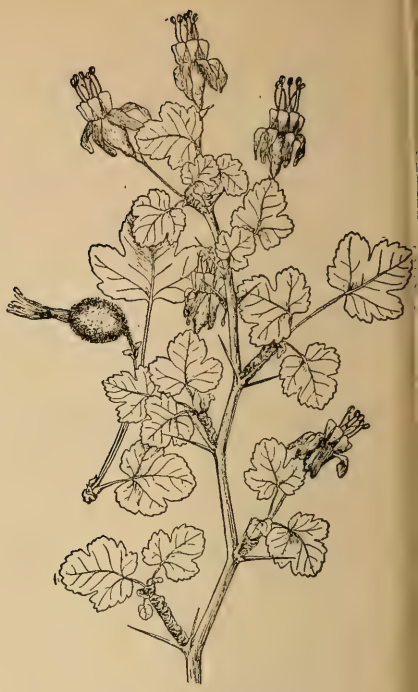

Fig. 48. *Ribes Lobbii.*

Fig. 47. *Ribes speciosum* (×2/3).

sanguineum. It has been frequently grown both in the United States and in Europe, and seems to be everywhere prized. The flowers are rose-colored or reddish purple, borne in long, leafless racemes and produced in great profusion. Unfortunately, it is not entirely hardy in the northern states, needing some protection, which the beauty of its bloom will well repay.

A hardier plant is the hybrid between the preceding species and *Ribes odoratum*, which is commonly known under the name *Ribes Gordonianum*. This is not so hardy as *Ribes odoratum*, but will stand more exposure than *Ribes sanguineum*. It is intermediate in character between the two parents, resembling *R. sanguineum* in shape of flower, though the flowers are lighter in color and nearly odorless, while the character of bush is more like *R. odoratum*. Although not a common plant, it has been well known, both here and abroad, and frequently mentioned in horticultural literature.

Several species of the Menziesii group have large, attractive flowers, particularly *R. amictum*, and *R. californicum;* also, *R. Lobbii*. (Fig. 48.) *R. alpinum* and *R. fasciculatum* have ornamental scarlet fruits, those of the latter species ripening in September and remaining on the plants during winter. They are recommended for borders of shrubberies and the trailing kinds for slopes. *R. alpinum* is said to be excellent for shady places. *R. alpestre*, a strong-growing and very spiny gooseberry from China is suggested as a possible hedge-plant of value.

For a full account of the botany of the cultivated and American species of Ribes, the reader is referred to the Standard Cyclopedia of Horticulture.

CHAPTER XV

INSECTS INJURIOUS TO THE GROSELLES

THE groselles like other economic plants, are subject to attack from insects of divers character, appearance, and habits. The list immediately following comprises those most likely to work serious injury.

THE FOUR-LINED LEAF-BUG

Pœcilocapsus lineatus, Fabr.

This is a native insect which was first described by Fabricius in 1798. It came into notice as injurious to dahlias, currants and other plants soon after the middle of the present century, and has never ceased its evil ways from that day to this. Its food plants embrace esculent and ornamental plants and a few weeds.

The insect appears about the middle of May in northern latitudes, and takes up its abode on the tenderest leaves at the tip of the twigs. It is then too small to be readily seen, but by means of its proboscis, a perpetual self-acting pump, it immediately begins to drain the leaf of its sap. At first its work is not conspicuous, but soon becomes manifest by the appearance of small, dark spots, which later turn brown and die, the soft part of the leaf within having been sucked out. These spots, which at first are not larger than the head of a pin, may become much larger and even run together, causing the death of the entire leaf. The shoot itself may be checked in growth, or even killed.

The work of this insect, contrasted with that of leaf-spot and anthracnose fungi is shown at Plate XV, together with egg-clusters on a currant stem.

The nymphs, or immature forms of the insect, are at first very

Leaf-spot of red currant.—*Septoria ribis*. Courtesy of Geneva, N. Y., Experiment Station.

Anthracnose of red currant.

Injury by four-lined leaf-bug on a gooseberry leaf. After Slingerland and Crosby.

Egg-clusters of four-lined leaf-bug on stem of currant.

Plate XV. Afflictions of currants and gooseberries.

small, but easily recognized by the shining vermilion-red color of the body, marked by blackish spots on the thorax. The mature insect is a bright orange-yellow colored bug, three-tenths of an inch long, with four black stripes extending down the back.

The eggs are laid in clusters in slits near the tips of twigs of the present year's growth of currants, gooseberries, and other shrubs. They are deposited late in June, and remain in this position until the nymphs hatch the following spring. These undergo five moults before reaching the adult form. The adults disappear early in July, there being but one brood a year.

Remedies.—Since the insect feeds by sucking the sap of the plant from the inner tissues of the leaf, the application of poisons like Paris green can do no good. Kerosene emulsion, diluted with not more than five parts of water, if very thoroughly applied while the insects are still young, will prove effective. The egg clusters are not difficult to find, and since they remain over winter, trimming off and burning five or six inches of infested twigs is a practicable remedy, at least on a small scale.

Reference.

Cornell Univ. Expt. Sta. Bull. 58.

THE CURRANT PLANT-LOUSE

Mysus ribis, Linn.

This is a small, yellowish plant-louse, appearing on the under side of currant leaves, causing them to curl and present a blistered and generally reddish appearance on the upper surface. The shining black, cucumber-shaped eggs are attached to the bark of the new growth and hatch soon after the leaves open. The lice hatched from these eggs are all females and are called stem-mothers. When mature they give birth to living young. These in turn, and throughout the summer, are all females and are born alive. Until food becomes scarce nearly all are wingless, after which winged females are produced which migrate to other feeding grounds. As the lice become abundant they often cover the entire under side of the leaves, causing them to become very much curled and distorted. These leaves may fall later, preventing the fruit from ripening as it should. The fruit

may also be injured in appearance at least, by a black fungus which grows on the honey-dew secreted by the lice.

As the season advances the lice tend to disappear as a result of the attacks of their predaceous and parasitic enemies. Those which survive give birth to true males and females at the approach of cold weather. The females deposit shining black, cucumber-shaped eggs, which winter over, on twigs toward the end of October.

Control.—Plant-lice are easily killed by contact insecticides, such as kerosene emulsion, soap solutions or tobacco extracts, if they can be reached. The trouble is that the curled leaves protect them from the spray. Success depends on applying the remedy thoroughly and promptly, before the leaves become much curled. In the home-garden handpicking may be simpler.

Reference.

Geneva, N. Y., Expt. Sta. Bull. 139.

THE SAN JOSÉ SCALE

Aspidiosus perniciosus, Comstock

Although better known as an orchard insect, the San José scale is frequently found on currant and gooseberry. It is supposed to be a native of China, becoming first known in the United States at San José, California, about 1870. It was first discovered in the East in Virginia in 1893, but later observations indicate that it was at that time already widely spread throughout the eastern states. It was first described by Professor Comstock in 1880. Since that time more literature and legislation have been brought against it than toward any other plant enemy known to man. The insect is a near relative of the oyster-shell bark-louse. It appears on the plant or fruit as a round, gray scale about the size of the head of an ordinary pin. In the center is a dark nipple, surrounded by a yellowish ring. These are the larger scales which cover the full-grown females. The smaller scales are nearly black, with a central gray dot surrounded by a black depressed ring, bordered by a grayish ring. These smaller scales are thought to be the only ones which live over winter. The young are tiny, bright yellow little insects having six legs and able to crawl about readily. They soon find a place to suit their fancy, settle

down and insert their long mouthparts into the branch or fruit and begin sucking the juices from within. In a short time thereafter they become covered with the protecting scales described above. A single mother is supposed to produce from 100 to 200 young during her lifetime under average conditions, even 600 being possible. This enormous increase, together with the fact that being so securely attached to the part on which it lives it is so readily distributed on nursery stock, and the like, accounts for its widespread distribution and the difficulty with which it is controlled.

It is preyed upon by numerous parasites, some of which have been heralded as avenging enemies which would free us from the destruction caused by this pest. They doubtless aid, but the factors are too complex to afford any great hope for relief along this line.

Remedies.—The San José scale is not hard to kill if it can be hit. The chief trouble comes from the fact that it is so small and so easily missed that it is practically impossible to reach all the insects on the tree or plant. Then those which are left are able to multiply so rapidly that the tree is soon covered again.

Lime-sulfur, in some of its forms has proved the most dependable and all-round satisfactory spray. The oil sprays are more agreeable to use and spread over the plant better, so that insects are less likely to be missed, but unless conditions are right in every way often injure the trees or plants. Thorough work is essential, whatever the remedy applied.

So much has been written regarding this insect and its control that no attempt is made to cite references. A full account will be found in U. S. Bur. Ent. Bull. 62.

THE GOOSEBERRY FRUIT-WORM

Zophodia grossulariæ, Pack.

The larva of this moth works within the fruit of the gooseberry, and sometimes of the currant. The moths appear early in spring and deposit their eggs on the surface of the very young fruit. The larva bores into the fruit and eats out its contents. When one berry is disposed of another is fastened to the now empty shell, and the worm bores its way into that one. Several fruits may be thus

destroyed. The larva commonly reaches maturity by the first of July, when it is a pale green caterpillar, about three-fourths of an inch long, with a small, pale brown, horny looking head. It then descends to the ground and spins a thin cocoon among fallen leaves and rubbish, within which it changes to a chrysalis, remaining in this condition until the following spring.

Remedies.—Infested berries color prematurely, and can be hand-picked, taking care that the very active worms do not quickly leave the fruit. If chickens are allowed in the field after fruiting time, they will consume many of the chrysalids.

References.

Riley, Mo. Repts. 1: 140.

Saunders, Rept. Ent. Soc. Ontario, 7:39.

THE IMPORTED CURRANT BORER

Sesia tipuliformis, Clerck

This is a slender, rapid-flying, wasp-like, dark blue moth, half an inch long and three-fourths of an inch broad, having three yellow bands across the body and a yellow collar. It appears toward the end of May or the first of June, and deposits its eggs upon the stems near a bud. When hatched the larva eats its way directly to the center, thence upward and downward in the pith. Here it remains until the following year, meanwhile eating out a tunnel from six to twelve inches in length. When full grown, the larva is about half an inch long, white, with a brown head and a few hairs scattered over its body. Like many other immigrants in the insect world, this species appears to prosecute its work with renewed energy in the home of its adoption, far outstripping the native currant borer in the success of its undertakings. It prefers the red currant, but it is not too fastidious to accept the black currant or gooseberry as a substitute when occasion demands.

Remedies.—The method of treatment, which is the same for all species of borers attacking these plants, consists in pruning away and burning all infested canes, late in winter or early in spring, before the moths emerge. With several canes allowed to grow, and

all wood cut away after it has borne one or two crops, this result will be accomplished with little extra trouble.

References.

Cook, Mich. Hort. Soc. Rep. 1890: 106.
Colo. Expt. Sta. Bull. 19: 21.
Vt. Expt. Sta. Rept. 1894: 130.
Wash. Expt. Sta. Bull. 36: 14.

THE GOOSEBERRY SPAN-WORM

Cymatophora riberearia, Fitch

This is the larva of a native pale yellowish moth, marked with several dusky spots, and measuring about an inch and a quarter across. The larva when full grown is about an inch long, of a whitish color, with broad yellow stripes running down the back and sides, and with a number of black spots on each segment. It is a "measuring worm," moving by arching its body in the center. When disturbed, it drops from the leaf and remains suspended in the air by a web. It is most commonly found upon the gooseberry or black currant, appearing soon after the leaves expand and feeding upon them. It attains its full growth within three or four weeks, descends to the ground and transforms to a pupa, hidden by rubbish, or just beneath the surface of the ground. The moth emerges about two weeks later. The beautifully sculptured eggs are laid singly on the twigs, which they resemble in color, and are therefore hard to detect. Here they remain until spring, there being but one brood a year. It thus happens that the sale of plants affords a ready means for the spread of the insect.

Remedies.—This is commonly not a serious enemy, but when it does become numerous, is more difficult to destroy than the ordinary currant worm. Hellebore is not effective. Arsenate of lead at the rate of two pounds to fifty gallons of water will give good results when the worms are small. When full-grown they are not easily poisoned. Paris green, using one-fourth as much, may replace the lead arsenate, but the latter sticks to leaves better.

References.

Fitch, Rept. N. Y. State Ent. 3: 427.
Riley, Mo. Rept. 9: 3.

THE GOOSEBERRY MIDGE

Dasyneura grossulariae, Fitch

This insect is a small, yellowish fly, with black eyes, scarcely one-tenth of an inch long, resembling a mosquito in form. The eggs, which are deposited beneath the skin of the young fruit, hatch and develop into small, bright yellow, oval maggots, resembling those of the wheat midge. These change to pupæ within the fruit, and emerge as perfect flies in midsummer. Further than this the life history seems to be unknown. Their presence causes the fruit to turn prematurely red and become soft and putrid within.

Remedies.—The only remedy thus far known to be effective is to pick and destroy all fruit which turns prematurely.

Reference.

Fitch, Rept. N. Y. State Ent. 1: 176.

THE YELLOW CURRANT FRUIT-FLY

Epochra canadensis, Loew

This insect is a yellow or orange-colored fly, about the size of the common house-fly, with greenish iridescent eyes and smoky patches or bands across its wings. It punctures the skin of the young currant or gooseberry, depositing its egg just beneath. This soon develops into a small white grub which measures about one-third of an inch in length. Its presence causes the fruit to turn red and fall to the ground prematurely. After becoming full grown, the maggots leave the fruit and enter the ground, where they change to pupæ, emerging as perfect flies early the following summer.

This insect is most troublesome in the West, especially in the Mountain region, where wild groselles are abundant and afford breeding-grounds for it. In Colorado it is considered the worst enemy of these fruits.

Remedies.—No very practicable remedy seems yet to have been found. The insect spends about eleven months of the year safely buried in the ground. No way of destroying the mature flies seems feasible, and the egg is deposited beneath the skin of the fruit beyond the reach of insecticides. Part of the infested fruit drops pre-

maturely and the larvæ remain in it for a time. Not all the insects fall with the fruit, some escaping before it drops. Yet allowing chickens among the bushes until picking time and again thereafter, has been thought to help. The pupæ transform within an inch of the surface. Frequent cultivation may therefore destroy some.

References.

Maine Expt. Sta. Rept. 1895: 111.
Colo. Expt. Sta. Bull. 19: 18.
Paine, Psyche, 19: 139.

DARK CURRANT FRUIT-FLY

In the Pacific Northwest a closely related species, *Rhagoletis ribicola*, Doane, termed the dark currant fruit-fly, attacks the fruit of both currants and gooseberries. Its life history and habits are much the same as the above and it must be combated in the same way.

Reference.

Wash. Expt. Sta. Bull. 36: 3.

THE AMERICAN CURRANT BORER

Psenocerus supernotatus, Say

This insect, though very similar in its habits to the imported currant borer, belongs to an entirely different order. When mature, instead of being a moth, it is a small, narrow, brownish beetle, nearly cylindrical, and varying in length from one-eighth to one-fourth of an inch. The larva is a small, white, round and wrinkled grub without feet. The life history is practically the same as that of the imported insect, and larvæ of both are sometimes found together in the same stalk.

The food habits of this insect are peculiar in that it seems to prefer working in canes which are attacked by the currant cane-blight, *Botryosphæria Ribis*, feeding upon the spores and growing parts of the fungus itself. The beetles are often found abundantly in late May and early June, both in the field and in material which has been collected and brought inside. The larval and pupal stages

are passed in stems which have been killed by this disease, but the place of egg-laying is in doubt.

Remedies.—Cutting out and burning infested stalks will prove effective.

References.

Fitch, N. Y. Rep. 3: 416.

Cook, Rep. Mich. Hort. Soc. 1890: 106.

Geneva, N. Y., Expt. Sta. Tech. Bull. 18.

THE IMPORTED CURRANT WORM

Pteronus ribesii, Scopoli

This most familiar inhabitant of the currant and gooseberry bushes is a four-winged saw-fly, about the size of the common house fly. It first appeared in the United States in the vicinity of Rochester, N. Y., about 1857, being mentioned in "The Rural New-Yorker" of July 24, 1858, p. 239. The male is black, with some yellow spots, glossy wings and yellow legs. The female is larger than the male, bright honey yellow, with a black head. It is not in this dress, however, that we best know the insect. Its eggs are deposited in rows on the under side of the leaves, along the principal veins (Fig. 49), in early spring. Dr. Lintner observed a female deposit thirty eggs on a single currant leaf within one hour. These hatch in a few days, and open the season's campaign by eating small holes in the leaf. The eggs are laid in rows, and the young larvæ at first feed in companies (Fig. 50), but later, as size and appetite increase, they scatter to all parts of the bush.

Fig. 49. Eggs of the imported currant worm.

The insect is fastidious in its dress during the larval stage. It first appears in a modest garb of dull white, which it soon exchanges for

green, to which many black spots are added later, these in turn giving place to a plain green tinged with yellow, as it approaches maturity. When full grown, it measures about three-quarters of an inch in length. It then forms a silken cocoon, hidden by rubbish on the ground, just beneath the surface, or occasionally attached to stems and leaves above ground. The winged insect emerges the last of June or first of July, to repeat the same cycle, there being two broods a year, the last one passing the winter in the cocoon in the larva or pupa stage. The separate broods do not emerge all at once, hence there is a practical continuation of hostilities throughout the season.

Fig. 50. Early work of the currant worm.

Remedies.—A history of the remedies which have been employed against this insect since its advent in this country would afford spicy reading, with no lack of variety. It is interesting to note that the use of kerosene emulsion seems to have had its beginning in fighting this insect, about 1870.[1] The following brief mention will show something of the range of ammunition brought into play against this enemy. Salt and water, Gardener's Monthly, 1881: 17. Tobacco water, Ibid, 1881: 241. Sulphur sprinkled on the bushes when wet, Ibid, 1882: 148. Smudge with burning leather and sulphur under the bushes, Ibid, 1862: 213. Red currants untouched if black currants are planted among them, Tilton's Journal, 8: 35. Copperas dissolved in water, Ibid, 8: 23. Carbolate of lime, Ibid,

[1] Tilton's Journal, 8: 23, 176–9: 213. Gardener's Monthly, 1874: 149.

9: 149. Tansy decoction, Ibid, 9: 246. Wood ashes applied when leaves are wet, Ibid, 9: 309; also "Rural New-Yorker," 1897: 375. Carbolic acid, Horticulturist, 1870: 221. Picking off leaves at base of bushes where most eggs are deposited before they hatch, or immediately after. Coal tar dissolved in turpentine, with slaked lime and water added, Ibid, 1870: 222. Knocking off the worms to let them fall on the hot ground when the sun is bright, Ibid, 1871: 159. Howe Cave fertilizer, Grafton mineral fertilizer and Colburn's currant-worm exterminator mentioned as ineffectual, Ibid, 1873: 172. Mixing wood ashes with the soil, Ibid, 1873: 192. Mulching with tobacco stems, "Popular Gardening," 2: 129. Mulching with coal ashes, Ibid, 6: 220. Air-slaked lime and tobacco dust, Insect Life, 1: 17. Alum, Ibid, 1: 229. Decoction of foxglove, Gar. Month., 1874: 254. Soot, also rue and chamomile planted among the bushes, Tilton's Jour., 4: 233. Decoction of elder leaves and tobacco water, Ibid, 7: 187. Young chickens, Hovey's Mag., 1854: 527.

In 1869, the Massachusetts Horticultural Society offered a prize of twenty-five dollars for "a safe, certain and economical method, better than any now known, of destroying the currant worm, or preventing its ravages."

The most effective treatment is spraying with arsenate of lead at the rate of about two ounces to three gallons of water (two pounds to fifty gallons). One-fourth the amount of paris green may be used instead if necessary. This spraying should be done early, while the worms are still on the lower leaves. If neglected until the fruit has developed so as to make arsenites unsafe, hellebore at the rate of about a tablespoonful, an ounce or more, to the gallon of water, must be substituted. This may also be used dry, at the rate of one pound to five pounds of air-slaked lime.

Allowing the bushes to be defoliated, even after the fruit is off, injures the crop of the following year.

Reference.

Marlatt, Revis. Nematinae of North Amer., 61.

THE GREEN CURRANT WORM

Gymnonychus appendiculatus, Hartig

This insect has been commonly known as the native currant worm, but it too seems to have been imported from Europe, hence that name should be abandoned. It is widely distributed and sometimes does noticeable damage in the West, but is seldom destructive in the East. It is somewhat closely related to the common currant worm but the flies are smaller in size, and both sexes are black. The flies appear in spring as the leaves are unfolding, and the eggs are laid in the edge of the leaf between the two layers. The worms are solid green in color, with blackish heads, never having black spots like the preceding species. They do not feed in groups. They reach full size in about five days, spin small brownish cocoons underneath trash or just below the surface, and emerge as perfect flies in about a week. There may be four or five broods in middle latitudes, each requiring about twenty-five days from egg to adult.

Treatment.—The same methods employed in fighting the common currant worm may be used against this one.

References.

Walsh, Pract. Ent. 1: 123.
Riley, Mo. Rept. 9: 23.
Saunders, Rept. Ent. Soc. Ont. f., 1871: 34.

THE CURRANT STEM-GIRDLER

Janus integer, Norton

This, too, is a native saw-fly, but the larvæ, instead of feeding on the leaves, like the others, burrow in the pith of the currant stems. The egg is laid within the pith of the young shoots a few inches from the tips. After depositing the egg the female fly moves upward and proceeds to girdle the stem at a point from half an inch to an inch above where the egg was placed. The cane may be entirely severed by this girdling, or may still cling by a small portion, but quickly wilts, and generally soon falls away. The larva, which is nearly half an inch long at maturity, burrows downward, eating out the pith as it goes, and leaving its channel filled with dark brown-

ish refuse. Toward autumn it eats a passage way to the outer bark, wraps itself in a thin silken cocoon and passes the winter in the lower end of its burrow. In the spring it changes to a pupa, and thence emerges as a perfect insect in May. The female is then a shining black fly with light brownish-yellow legs and the front of the abdomen reddish orange. She is about half an inch long by three-fourths of an inch broad, with wings extended. The male is somewhat smaller and nearly all of the abdomen is brownish-yellow.

Remedies.—Cutting out and burning all injured tips is an efficient and practical remedy. The larvæ rarely get more than six inches below where the egg is laid, and this being only an inch or so below the girdle, cutting away eight inches of the stem at any time during the summer or winter, will destroy the insect. If done soon after the girdle is made two or three inches will suffice. The larvæ may readily be found by splitting open the cane. Many eggs fail to develop, and the young larvæ often perish before attaining their growth. This checks their increase, but does not affect the injury for the current year.

References.

Marlatt, Ins. Life, 7: 387.

Slingerland, Cornell Univ. Expt. Sta. Bull. 126: 41.

THE GROSELLE STEM-MINER

Opostega nonstrigella, Ch.

This is a very minute insect, the larva of which mines in the outer bark of currant and gooseberry shoots. Its presence is shown by fine, dark streaks in the outer wood near the tips. The streaks are more or less parallel and extend up and down the canes for a short distance, having rounded connections at the ends. These are the mines of a very tiny, whitish, thread-like larva, with whitish body and dark head, but so minute that it is very difficult to detect. The largest larvæ are found in the previous season's growth or reaching across from that to the new shoots. The larva first mines its way toward the tip, turns back in the opposite direction parallel to this, again turning and reëntering the same mine at the starting point, then

remining that. After making some two rounds of the channel it emerges to pupate in the ground. The adult is a small silvery-white moth. An infested twig is shown in Plate VIII.

The direct injury caused by these miners is not likely to be serious. Greater harm is likely to follow from the work of fungi which may gain entrance through the wounds made by them. Some injury to gooseberry shoots has been observed from this cause.

The injury caused by the miners has been commonly known under the name of "medullary spots."

Control.—No definite means of control are known, though it has been suggested that cultivation about the plants during the pupal stage may prove helpful.

Reference.

Geneva, N. Y., Expt. Sta. Tech. Bull. 15.

THE LESS IMPORTANT ENEMIES

The foregoing list includes those insects which are likely to prove seriously injurious, but many others feed upon these plants. At times a few of these may do real damage. Many are general feeders and if groselles happen to afford the most available food they are likely to suffer. Among the ones most likely to occur may be mentioned the following.

Lycia cognataria, Guenêe, termed the pepper and salt currant-moth by Slingerland and Crosby, is a general feeder, the larva of which seeks to escape detection by resembling a dead twig. When full grown it is nearly two inches long. It is seldom likely to cause serious harm.

The walnut scale, *Aspidiotus juglans-regiae*, Comstock, sometimes attacks currant stems. It is closely related to the San Josê scale but larger in size. The same methods of treatment should prove effective.

Several other species of scale insects are also found on these plants. Green fruit-worms, leaf-rollers, climbing cut-worms, the apple leaf-hopper, flea-beetles, red-spider, and even the flat-headed apple-tree borer may be found at times, but seldom need cause concern.

CHAPTER XVI

DISEASES OF THE GROSELLES

MANY fungi are known to attack the genus Ribes, yet few do harm enough to demand consideration from an economic stand point. The one which is best known, and which has created far more discussion than any other in American horticultural literature, is the gooseberry mildew. This disease alone, like the phylloxera of the grape, has forced the development of varieties from native species, which doubtless would not have been done had the English varieties proved successful in this climate. The following list includes those diseases which are most important.

GOOSEBERRY MILDEW

Spærotheca mors-uvæ, Schw., B. and C.

This is one of the most widely known of the diseases affecting the genus Ribes. It first appears on the young leaves and tender tips of the growing shoots. The young fruits are soon attacked in the same way and partially or entirely checked in their growth, being rendered wholly unfit for use in most cases. It first appears as a patch of cobweb-like threads, which soon form a dense mat and become white and powdery from the development of white conidial or summer spores. These are produced in immense numbers, and are readily blown about by the wind, or carried by rain, to contribute to the further spread of the disease. A few weeks later the winter spores, or ascospores, begin to develop. These are contained within chestnut-colored perithecia, which give a dirty brown appearance

to the affected parts. These spores remain over winter within the protecting perithecium and germinate in spring, thereby spreading the species the succeeding year.

In former years this disease appears to have been confined to America, but about 1900 it appeared in Europe and since that time has come to be very destructive there. European varieties are much more susceptible than American sorts, hence it has been able to spread more rapidly, even though the climate may be less favorable to its development. In America the disease is less serious in the northern portions of the United States and in Canada than farther south. Many English varieties or their seedlings have been introduced as mildew proof, only to suffer the same injury as previous sorts after a few years of general trial. The American varieties are not wholly exempt from attack, but are much less susceptible, and seldom suffer serious injury.

Remedies.—Numberless remedies against the disease have been suggested. No less than fifteen of these have come under the writer's observation, most of which were reported successful in greater or less degree. Among them, mulching with sea weed, salt hay, green grass, tan bark, stones, tin cans, boards, etc., is most frequently mentioned. This does aid in many cases, as it helps to keep the soil cool, but it cannot be depended upon to afford immunity.

This disease is more difficult to control than some others, because the mycelium of the fungus is more persistent. Potassium sulfide, at the rate of half an ounce to each gallon of water, is one of the best remedies known. It should be applied first as the buds are opening, and repeated at intervals of ten to fourteen days if the disease promises to be serious. Lime-sulfur in the proportion of one to forty, is also effective. If the disease is very abundant three or four sprayings may be needed. Bordeaux mixture is not a satisfactory remedy.

Reference.

Geneva, N. Y., Expt. Sta. Bull. 161.

ANTHRACNOSE

Pseudopeziza Ribis, Kleb.

Although not so well known as the gooseberry mildew, this disease is one which often causes serious damage to currants and gooseberries by attacking the leaves and causing them to fall prematurely. The disease is widely distributed in this and other countries and probably occurs wherever these fruits are grown. Some varieties are more susceptible than others. Gooseberries generally suffer less than currants. The fungus first appears on the upper surface of the older leaves, causing small, round, dark brown spots, about one-twenty-fifth of an inch across. A small black spot is soon formed in the center of each brown one, and the entire leaf turns yellow. The leaf and flower-stalks, young canes and fruit are also attacked. On the fruit it appears as small black specks, being especially noticeable on the gooseberry. See Plate XV.

The fungus is spread during summer by spores which develop in a fruiting body that is formed within the tissues of the plant. When mature these fruiting bodies break through the surface and push out the summer spores in a sticky mass which readily dissolves in water and is scattered by wind and rain. The spores need moisture for germination and the disease spreads more rapidly in damp cloudy weather.

Control.—Bordeaux mixture at the rate of 5–5–50, or lime-sulfur at the rate of 1 to 40 or 50, has been found an effective remedy. The first spraying should be given about the time the leaves appear, and be repeated at intervals of ten to twenty days. Five or six sprayings are generally needed, depending somewhat upon weather conditions. The foliage must be kept well covered throughout the summer if the treatment is to be thoroughly effective. The addition of lead arsenate, at the rate of two pounds to fifty gallons of water, at the first and second sprayings, will control currant worms as well.

Experiments made by Cornell University Experiment Station indicate that dusting with finely-powdered sulfur, nine parts, and powdered arsenate of lead one part, is also effective in controlling

the disease. The arsenate of lead not only serves as an insecticide but adds to the sticking qualities of the dust.

References.

Geneva, N. Y., Expt. Sta. Bull. 199.

Cornell Univ. Expt. Sta. Bull. 358: 194 and Circular 32.

CURRANT LEAF-SPOT

Septoria Ribis, Desm.

This leaf-spot is similar to anthracnose, but the spots are larger, usually about an eighth of an inch in diameter, and more or less irregular. They are clearly marked and brown about the borders, with light-colored, grayish centers. As the spots grow old, several minute black specks appear in these grayish centers. The spots of anthracnose are dark-colored and often not larger than the head of a pin. If the spots are numerous the leaf turns yellow and falls, as with anthracnose. The two diseases are often found growing together. All varieties of currants and gooseberries are attacked but some suffer more than others. The spores are spread in much the same manner as are those of anthracnose and the same weather conditions favor their development. It is thought to pass the winter on the fallen leaves. The appearance of the two diseases is shown in Plate XV.

Control.—Leaf-spot is controlled by the same means as anthracnose. The treatment should be virtually the same whichever disease may be present. Still another fungus, *Cercospora, angulata*, Wint., has been reported on red and black currants growing with leaf-spot and yielding to the same treatment.

References.

Iowa Expt. Sta. Bulls. 13 and 17.

Geneva, N. Y., Expt. Sta. Bull. 199.

Cornell Univ. Expt. Sta. Bull. 358: 198.

CURRANT CANE-BLIGHT

Botryosphæria Ribis, Gross. & Dug.

Much confusion has existed regarding the name of this disease, because the fungus which produces it has three distinct spore-forms.

This has led to different classifications and names at different times. The first indication of the disease is the wilting of the leaves on certain canes or parts of canes. These soon turn brown and die. A section of dead wood will be found, from one to four inches in length, where the bark has been killed and the wood and pith invaded by the fungus. This prevents the movement of sap and the parts above wither and die. The general appearance is much like that of the work of cane-borers, but no burrows or insects are present. The whitish mycelium within the pith can be detected by the aid of a hand lens and sometimes even with the naked eye.

The disease is known in different localities but has proved particularly destructive in the Hudson valley. It is there considered one of the chief obstacles to successful currant-culture. The plants are rarely killed outright, but as they grow older more and more of the canes are affected until so little fruiting wood remains that the plantation no longer pays. While it varies in intensity somewhat from year to year it never disappears from a plantation once attacked.

A point of interest in connection with this fungus is that it appears to be the favorite food of the American currant-borer, *Psenocerus supernotatus*, which feeds upon the spores and growing parts, both in the field and in collected material.

Control.—No practicable means of controlling the disease seems to be known. Careful experiments in cutting out the diseased wood at frequent intervals during the growing season failed to hold it in check, in experiments made by the Geneva, N. Y., Experiment Station.

References.

Geneva, N. Y., Expt. Sta. Bulls. 167, 357 and Tech. Bull. 18.
Cornell Univ. Expt. Sta. Bull. 125.

CURRANT FELT-RUST

Cronartium ribicola, Fisch, de Wald.

This fungus, like some other rusts, passes one of its stages on one plant and one on another. The other host-plant of this one is usually the white pine, though other five-leaved pines may be affected. The fungus lives from year to year in the pine, but the spores which are

there produced cannot infect other pines. Hence the disease cannot spread directly from pine to pine. It must first go to the groselles and from there back to pine. Various species of currants and gooseberries are subject to attack. Certain spores produced by the fungus while living on them can only infect the pine. Those of another type affect groselles readily, so that during summer and autumn the disease may spread readily among these plants. Only the leaves of these plants are attacked, so that the work of the fungus ends with the season, so far as they are concerned. Difficulty in explaining certain outbreaks of the disease have led to the suggestion that perhaps in some form the fungus may pass the winter on Ribes plants. Careful experiments have shown, however, that rarely if ever does such a thing occur, and then certainly not under normal conditions.

Control.—This rust is a European disease, and is found chiefly on imported pines. Since it is only from such sources that it can spread, care should be taken to prevent the dissemination of such stock or its being allowed to remain if found. The fungus is a more serious enemy to the pine than to the groselles. In Europe it has driven the growing of white pine out of some nurseries and localities. It has been urged that the importation of five-leaved pine should be stopped and that they should be kept away from groselles in the nursery. If the disease is found it is recommended to destroy the least valuable group entirely and all diseased plants in the other.

Just at the present time this disease appears to be causing great consternation in the United States. Several states have established quarantine regulations forbidding the importation of five-leaved pines and of currants and gooseberries within their borders.

References.

Geneva, N. Y., Expt. Sta. Bull. 374 and Tech. Bull. 2.

Bur. of Plant Indus. Bull. 206.

GOOSEBERRY CLUSTER-CUP

Puccinia ribis-caricis, Kleb.

This disease takes the form of reddish-yellow swellings on the leaves and fruit with clusters of minute cups imbedded in the dis-

eased tissue. It varies much in frequency. Ordinarily it causes no damage, but occasionally seems to develop with unusual rapidity, and works serious injury. It is difficult to combat, for when the cluster-cups appear so that the disease is noticed, the harm for that year is already done. Since the causal fungus, in its winter condition, infests various species of common sedges the destruction of all sedges in the vicinity should be helpful in the control of the disease. Perhaps spraying for the gooseberry mildew may prevent the earliest infection.

PART IV

MISCELLANEOUS TYPES

CHAPTER XVII

OTHER SPECIES OF BUSH-FRUITS

ALTHOUGH the foregoing pages describe all the bush-fruits which have much commercial importance in cultivation, there are certain other types which are either coming into domestication or which are occasionally seen in private gardens. To these we shall now give attention.

BUFFALO BERRY

Shepherdia argentea, Nutt. *Lepargyræa argentea*, Greene.

The buffalo berry is a thorny, deciduous shrub, growing from 5–20 feet high, with a whitened or silvery appearance throughout. Its leaves are narrow, 1–1½ inches long, pointed at the base, entire, and silvery white on both sides. The flowers are small, yellow and dicœcious. The fruit is round or ovoid, scarlet, or more rarely yellow, with a single smooth seed, and a sprightly acid and agreeable flavor. It is borne in very compact clusters in the axils of the small branches, ripening in July, but remaining on the bushes till frost, or later. The plant occurs throughout the Plains, westward to the Sierra Nevada Mountains,

and from the Saskatchewan southward to the mountains of New Mexico.

The name buffalo berry is said to have been derived from the custom of eating the berries as a sauce with buffalo meat. It has also been known as rabbit berry and blood berry, while Crozier states [1] that it has even been improperly called cornelian cherry. A writer in the "Gardener's Monthly" [2] speaks of it as the Nebraska currant.

The buffalo berry has enjoyed the distinction of remaining a new fruit for a very long time. In 1841, William Oakes, in discussing the advance of spring in eastern Massachusetts, mentions the buffalo berry, and incidentally states that it was then frequently cultivated. This was the same year that our earliest cultivated blackberry made its first appearance on the exhibition tables of the Massachusetts Horticultural Society, and some years before either the black raspberry or the blackberry came into general cultivation. Yet we are still talking about the buffalo berry as a new fruit which ought to be introduced. Fuller, in his "Small-Fruit Culturist," published in 1867, gives a full account of it. The fruit possesses good qualities, and the plant is useful in ornamental planting, but it is not likely to be extensively grown as a fruit-producing plant, unless it should be in localities where other garden fruits fail. N. E. Hansen, of South Dakota, writes that he considers it of promise only where the currant does not do well. Attempts to establish it in Nebraska have thus far met with indifferent results. The fruit is abundant, but its large seed and the thorny habit

[1] Amer. Garden, 11: 650.
[2] 1873: 23.

of the plant are against it. Plants vary in the latter regard, and careful selection might develop forms comparatively free from thorns. The berries vary much in size, commonly being about the size of currants, though sometimes as large as small gooseberries. It generally occurs along the borders of streams, which indicates that it may need a moist soil. It is sometimes found on loose, dry sand, but with available moisture beneath. Its early-blooming period may subject it to injury from spring frosts, hence a cool northern slope would be desirable.

Plants are propagated from suckers, cuttings or seeds. The suckers are produced but sparingly, but are readily separated whenever found. From the fact that a large number of plants produced from suckers proved to be all staminate, S. B. Green was led to infer [1] that perhaps the staminate plants produce more suckers than the pistillate. Later observations did not enable him to settle the point definitely. It is said to grow readily from cuttings taken in autumn and treated like grape and currant cuttings. Seeds should be planted when the fruit is ripe, or mixed with sand and planted the following spring. Fuller states [2] that the best way is to plant at once in rows, one or two inches deep, transplanting into nursery rows when one year old. He says that they will usually bloom the third year from seed, when the staminate and pistillate plants can be readily marked or separated.

In planting, it is important to see that both sexes are placed together; otherwise no fruit can be produced.

[1] Bull. 18, Minn. Exp. Sta., p. 129.
[2] Small-Fruit Culturist, 252.

Failure has often resulted from inattention to this detail. L. C. Corbett has pointed out [1] that it is unnecessary to leave the young plants until they flower to determine their sex. He says: "There is another and easier way of distinguishing the staminate from the pistillate plants; *i. e.*, by bud characters while in a dormant condition. With care and experience one can readily separate the two." In the pistillate plants the buds are smaller, more slender, and arranged in less compact clusters.

The buffalo berry is worth planting as an ornamental shrub or small tree. Its silvery foliage is distinct and attractive, and its loads of fruit, if not taken by birds, render it a showy object throughout the closing months of the year. It appears to be perfectly hardy in the northern states when once established.

The fruit has a sprightly, agreeable flavor, which makes it pleasant to eat from the hand. It dries, but keeps indefinitely. Fruit which lay in my desk for several years still retained its sprightliness. Frost is said to greatly improve its quality, and it may be gathered from the bushes at any time during winter, if not previously taken by birds. It makes a very good jelly, and is said to be gathered in quantities by the Navajo Indians, who probably dry it.

The plants appear to be very productive, for they are loaded with berries. Yet Hoskins reported [2] that with him they yielded about one-fourth as much as barberries, and that the fruit was not very good. It may prove less fruitful in cultivation than in its native haunts.

[1] Amer. Gardening, 1895: 45.

[2] Rural New-Yorker, 1895: 826.

THE GOUMI (Fig. 51)

Elæagnus multiflora, Thunb.

The goumi is a low, bushy shrub, with dark gray or rusty brown branches, commonly unarmed, though sometimes bearing spines. The leaves are green above, silvery beneath, and sprinkled with dark colored spots. The flowers are small, yellowish within, silvery and roughly

Fig. 51. The goumi.

scurfy on the outside, often dark-dotted like the lower surface of the leaves. They appear by the middle of May, and are borne at the base of short side shoots of the current season's growth. The fruit is oval, blunt, or slightly flattened at the ends, half an inch or more in length, cinnabar-red or orange colored, and covered with silvery white dots. It ripens in July, and is juicy and fine looking, but at first very astringent, leaving a disagreeable taste in the mouth. This quality disappears to some extent when the fruit is fully ripened.

The plant grows wild in eastern Asia, from Himalaya

and Nepal, north to China and Japan. It appears to have been first brought to notice in England in 1873, having been exhibited before the Royal Botanical and Royal Horticultural Societies that year. William Falconer writes [1] that in August, 1889, Ellwanger & Barry had but a single plant of it. Reports differ as to the edible quality of the fruit. William Falconer, in the above note, says that it is cooked and used as a sauce with meat, especially chicken, and "it is one of the most delicious sauces that ever tickled the human palate." Others do not speak so favorably of it, saying that cooking increases its disagreeable astringent qualities. Bailey says [2] that he enjoys eating the fruit from the bushes when fully ripe, but has not tried it for culinary purposes. It is too acid for dessert, being better adapted to uses like those of the cranberry. It is also recommended for jelly.

The plant is perfectly hardy in the eastern states, and immensely productive. Its close relation to the so-called Russian olive, *Elæagnus angustifolia*, which is a very reliable tree throughout the northwest, indicates that it may also prove hardy in that region. It is said to succeed well in California on various soils. In regard to propagation, Bailey says: [2] "The goumi grows readily from seeds. These should be sown or stratified in summer, before they become dry, and allowed to freeze the following winter. The next spring they should germinate freely. Cuttings of the half-ripened wood strike readily in June or July, if handled in frames."

The goumi is certainly a promising ornamental plant.

[1] American Garden, 11: 119.

[2] Bull. 117, Cornell Univ. Exp. Sta., p. 383.

Its fruit is attractive while it lasts, and the foliage contrasts well with that of other plants. In nurseries the plant is sometimes known as *Elæagnus edulis*, and in various places it has received mention under the name *Elæagnus pungens;* it is also known as *Elæagnus longipes.*

A closely related species, *Elæagnus umbellata*, also known under the name "Silver Thorn," has been sometimes sold for *Elæagnus longipes*, and in other cases sold under its right name. This is larger, more open and more thorny than the goumi, with lighter colored branches. Its fruit, which is smaller and possesses no value, ripens later. The plant possesses about the same ornamental qualities as *E. longipes*, but according to Dippel,[1] is less hardy in Germany.

HUCKLEBERRIES OR BLUEBERRIES

The confusion existing in the use of these two names may as well be discussed at the outset. What one means by their use depends chiefly on where he chanced to live. Throughout the southern, middle and mid-western states, where these fruits are common, the name huckleberry is a general term applied to all fruits of the group. In New England this name is limited to fruits of one genus, Gaylussacia, and chiefly to the common black huckleberry, *Gaylussacia baccata*, which is there so common. There the name blueberry is applied to plants of the genus Vaccinium, and more especially to *Vaccinium corymbosum*, the "swamp blueberry" of New England or "high huckleberry" of the middle states. This distinction

[1] Handbuch der Laubholzkunde, 3: 207.

would be more useful if all huckleberries were black and all blueberries blue. But the dangleberry, *Gaylussacia frondosa* is as much a blueberry in point of color as any of the others. Yet it belongs to the group known as huckleberries in New England.

In this discussion the word huckleberry may be taken in its broader meaning, as a general term covering all fruits of the group. The word blueberry will be used for fruits or plants of the genus Vaccinium.

The huckleberries belong to the heath family, or Ericaceæ, which includes a great many delightful wild wood plants, such as the wintergreen, the trailing arbutus, the heather, the mountain laurel, and the rhododendrons. In spite of the beauty and attractive graces displayed by so many of these plants, they belong to a modest and retiring family. They seldom mingle among the crowds of the open country, but withdraw to the quiet, shaded nooks of moist woods and mossy swamps, or climb to bare and rocky heights, where the solitude is even more impressive. So marked is this inherent shyness that most members of the family do not take kindly to cultivation. They pine for their woodland glens or rocky crags, no matter how tender the care bestowed upon them. Hence it happens that the huckleberries, though among the finest of fruits, and among the most important in the wild state, have been little known in cultivation up to the present time.

Several causes have prevented them from receiving more attention. In the first place, the fruit grows wild in abundance over large portions of the country. Added to this has been the uncertainty of success in transplant-

ing, which with some species is considerable, and which is evidently supposed to be much greater with all than it really is. But the greatest drawback has undoubtedly been the difficulty experienced in propagating. The spread of any plant in cultivation is largely dependent upon the nurserymen, and one which they find it hard and expensive to propagate is not likely to become widely cultivated. Both the difficulty in propagation and the indifferent results often attending attempts to grow it, have been largely due to the fact that the peculiar needs of the plant have not been understood until very recently.

The wild berry fields are yearly growing less. While many mountainous tracts are doubtless worth more as huckleberry patches than for any other purpose, unless it be to produce forests, on much of this land the huckleberry must give place to something else as time goes on and civilization and agriculture improve. But the huckleberry is too fine a fruit to lose, and it is a source of gratification to note that recent investigations are proving that it can be propagated and grown with full hope of success if the proper localities are chosen and the correct methods followed. The future of this fruit ought to be assured, for it is a promising one. It has no menacing thorns and its desirable qualities are numerous.

Commercially, the huckleberry is a fruit of very considerable importance, being gathered and shipped into the city markets in large quantities. The receipts in New York city are said to exceed 2,000 bushels a day in the height of the season, while the entire quantity sold is estimated to be ten times that of any other berry.[1] The

[1] Amer. Garden, 12: 18, 565.

annual huckleberry crop of Wisconsin has been estimated at 20,000 bushels, valued at between $60,000 and $80,000.

A few instances are on record of success in a commercial way under cultivation or semi-cultivation. These have usually consisted in treating wild huckleberry land in such a way as to increase the returns from plants already growing upon it. This may often be done to advantage. In swamps, competing growth may be cut away if the stand of plants will warrant. On wild land where low huckleberries are abundant, frequently burning over the area will improve the returns. This practice, by irresponsible parties, has often caused serious fires in the mountain regions of the Atlantic states. Some plan of encouraging and protecting the wild growth is about the only method which promises success with the low-growing kinds.

The high huckleberry or swamp blueberry has often been tried under garden culture, with varying degrees of success. Transplanting wild plants is not a difficult operation. The writer's experience, showed no greater proportion of loss than is likely to occur in moving other wild plants. Success depends not so much on transplanting as in the behavior of the plants afterward. In some cases they have thriven and borne well; in others they have gradually dwindled away and disappeared.

Among the attempts made to bring this plant under domestication, should be mentioned the work of A. S. Fuller, Jackson Dawson, of the Arnold Arboretum, Benjamin G. Smith, formerly Secretary of the American Pomological Society, and others. Dawson probably achieved greater success in propagating the blueberry than any other man up to recent times.

Investigations carried on by the United States Department of Agriculture, under the direction of Frederick V. Coville,[1] have thrown a flood of light upon the whole problem of bringing these plants under domestication. His experiments have been chiefly with species of the genus Vaccinium, which are most desirable as fruit-bearing plants. The following discussion of methods of propagation and culture is based on Coville's published results. The illustrations used were also furnished by him.

It has long been known that there is associated with the roots of these plants, a peculiar fungous growth, which has much to do with the nutrition of the plants. Both the blueberry and the fungus appear to profit by the partnership. It is believed that the fungus assists the plant in obtaining nitrogen. If the blueberry is to thrive, the conditions must be right for the fungus to thrive also. Coville has proved, what others had suspected, that to thrive the blueberry must have an acid soil. His observations appear to have been chiefly with *Vaccinium corymbosum*, but doubtless apply equally well to other members of the huckleberry family. The particular kind of acid soil formed by a mixture of sand and peat is the one in which the plants thrive best. In soils with an alkaline or neutral reaction, such as those of a well-manured garden, or of limestone regions, good results cannot be expected. Free access of air to the soil is also essential. Although the swamp blueberry, as its name indicates, is often found growing in swamps, it will not thrive where its roots are

[1] See "Experiments in Blueberry Culture," Bulletin 193, Bureau of Plant Industry, and "Directions for Blueberry Culture," Bulletin 334, U. S. Dept. of Agr.

permanently covered with water. Some species of low blueberries thrive on dry, rocky hillsides, but *Vaccinium corymbosum*, the one best adapted to garden culture, demands a soil with an abundant moisture supply.

Coville sums up the fundamental requirements of successful blueberry culture in the following words. "(1) An acid soil, especially one composed of peat and sand; (2) good drainage and thorough aeration of the surface soil; and (3) permanent but moderate soil moisture." He adds that with these conditions present, the root fungus will care for itself, since enough will be carried by the roots of the plant when set, to supply all needs.

With a knowledge of these essentials, it is evident that commercial ventures in the culture of this fruit should be undertaken only where these conditions prevail naturally. Late frosts are dangerous, particularly so because this type of soil conditions is likely to occur in locations especially subject to frost. Flooding is suggested as a possible means of preventing frosts, where conditions permit it.

Soil mixture

For use in propagation, and in starting plants in the field in a small way, where the needed soil conditions do not exist naturally, the following mixture is advised:— 1 part of clean sand, 9 parts of upland peat, either chopped or sifted, and 3 parts of broken flower-pots. If the latter are not available, more sand or sand and gravel should be used. No loam, lime, nor manure should be used. Manure is thought to injure the friendly root-fungus.

The peat best suited to the purpose is that found in thickets of mountain laurel, clumps of low blueberries, or

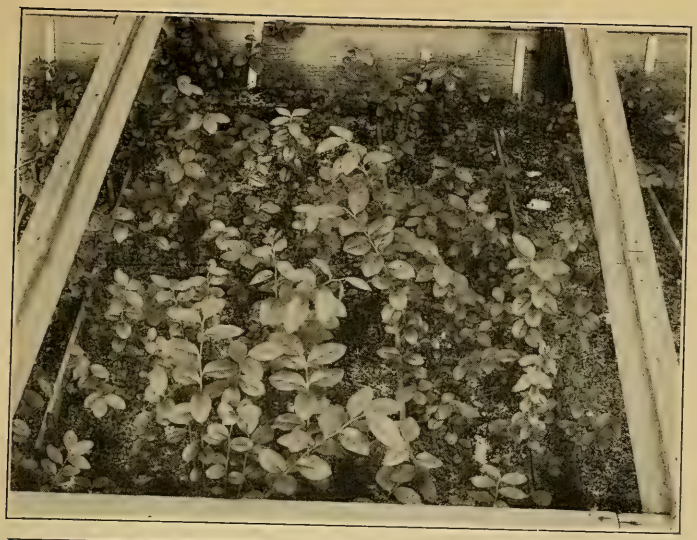

Plate XVI. Blueberries.—Propagation above; fruiting bush below.

from rotting oak leaves. Oak leaves alone, stacked and rotted for a time will serve. An interesting point brought out is that some leaves, especially maple, rot so quickly that within a year they pass the acid stage and become alkaline. They are then unsuitable and even fatal to the young plants. Oak leaves may reach the same condition in time if no fresh material is added, but decay more slowly.

Propagation in general

The difficulty of propagation has been one of the chief hindrances to more general cultivation of these fruits. Plants may be grown from seeds but this is not advised. The process is somewhat troublesome, and the results uncertain. Even when the seeds are taken from large fruit only, many of the resulting plants may bear inferior fruit. Budding and grafting may be used, but have little to recommend them, except in experimental work, because young shoots are thrown up from the roots. Four different methods of propagation are described by Coville, in "Bulletin 334," above cited. Each has proved successful, but no one has proved uniformly best under all conditions. The methods are termed "stumping," "tubering," winter cuttings and root-cuttings. They will be briefly described, but for more detailed directions the reader is referred to the above bulletin.

Stumping.—This is considered the easiest method. At any time from late fall to early spring, all or part of the stems of a plant are cut off close to the ground. A frame is placed around the stump and filled with a mixture of 2 to 4 parts of sand, to 1 of peat, covering the stumps 2 to 3 inches deep. This must be kept moist during summer.

The shoots which spring up from these stumps, through the sand and peat, develop the character of root-stocks, and throw out roots abundantly. They should be left in place the following winter but should be protected with a mulch. Early the following spring the sand is removed, and the shoots cut away from the parent stump. The tops are cut back to about three buds. A plant thus treated is shown at Fig. 52.

Fig. 52. New shoots developed by "stumping."

The young plants are placed in three-inch pots in a mixture of two parts peat to one of sand. The pots are then plunged in sand in a cool greenhouse or cold-frame. The frame is shaded with muslin and the temperature not allowed to exceed 65° F. Ventilation should be limited, and water given only often enough to keep the soil moist. New root-growth begins after the first twig-growth stops. Secondary twig-growth indicates success.

Tubering.—The term "tubering" is applied to a special method of growing hardwood cuttings. The simplest plan suggested is as follows. The cuttings are made in late fall, from unbranched pieces of the old wood, pref-

erably that which has grown in exposed situations and well stored with starch. These may vary in size from one-fourth inch to an inch, in diameter, and are cut 3 to 4 inches long. They are stored over winter in boxes of clean moist sphagnum moss, at a temperature of about 40° F. Early in spring they are pressed into beds of clean sand, in a coldframe, to about the depth of their own thickness. The sand is then covered with a one-inch layer of sifted peat two parts, and sand one part. The frames are shaded by a muslin framework about seven feet from the ground. No ventilation is given until most of the plants are rooted, about midsummer. The shades and sash are removed early in October. Late in autumn they are removed from the frames, the stronger ones going directly to field plantations. The weaker ones are set in nursery rows for another season's growth before being planted.

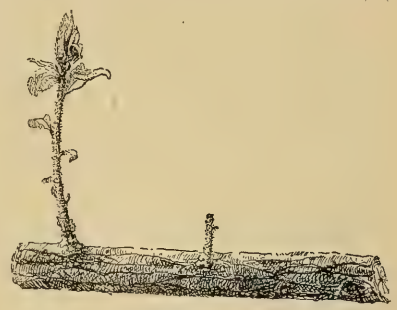

Fig. 53. "Tubered" cutting with young shoots developing.

Shading the frames is considered important in all methods. Locating them on the north side of buildings may reduce the need for shade but even then it will be needed morning and afternoon in summer, when the sun may reach them. Figs. 53 and 54 show tubered cuttings in different stages of development.

Winter cuttings.—These are ordinary stem-cuttings,

made from wood of the previous season's growth, cut four or five inches long. They may be taken in the fall and stored, or cut when wanted. They may be started in the greenhouse and transferred to the coldframe later, or put in the coldframe at first. The important point is to avoid high temperatures.

Fig. 54. "Tubered" cutting with shoot rooting at the base.

For the cutting-bed a one-inch layer of clean sphagnum is placed on a good drainage foundation. This is covered with three inches of clean sand. The base of the cutting should reach nearly to the sphagnum. The frame must be shaded and the sash tightly closed to secure a saturated atmosphere. When the first twig-growth has been completed, the bed is mulched with about half an inch of sifted peat two parts, and sand one part. When the cuttings have begun to root, which is indicated by secondary twig-growth, ventilation is begun. This must be very slight at first, and increased slowly, through a period of several weeks, before full exposure is given. Young plants are very susceptible to injury from over-ventilation during the propagating period. These winter cuttings are best left in the coldframe over winter, being mulched with

leaves. In early spring they are transferred to a nursery-bed of peat and sand in the open field. This method of propagation requires close attention, and not all the cuttings can be expected to succeed. Young plants grown from cuttings are shown at Plate XVI.

Root-cuttings.—Root-cuttings, three to four inches long, made from roots of all sizes, have given excellent results. They are started in coldframes, with the same treatment given to tubered stem-cuttings.

After culture

All young plants, when once rooted, are best exposed to winter freezing. Hot summer suns may injure the young leaves and growing tips. Partial shade will obviate this.

A peculiar habit of root-growth is found to be characteristic of blueberry plants. A knowledge of this is important in transplanting. No root-growth is made in spring until the plants are in full leaf, are nearly through flowering, and have made most of their twig-growth. All this early growth is made chiefly from the food stored up the preceding year.

This means that in spring planting it is important, either to move all the roots, or to cut back the tops severely. With young, nursery-grown plants, care will secure the roots unharmed. When wild plants are to be brought to the garden, the tops are best cut to stumps which reach only two or three inches above the ground when planted. Such plants can be divided when replanting, often affording a number of stumps with roots attached. Early spring is the best time for planting, when plants are cut back in this way.

With unpruned plants, early fall planting gives excel-

Fig. 55. Comparative effects of self- and cross-pollination.

lent results. This has been found to be an especially favorable time for removing potted plants to the field.

Interpollination is an important factor in fruit production. This is accomplished chiefly by bumblebees and other wild bees. The corolla is too long for the honey-

bee. Self-pollination gives inferior results at best; some plants are almost completely sterile. Furthermore, every plant propagated from a parent plant by any of the methods indicated is essentially that same plant, so far as this factor is concerned. This means that plants propagated from more than one bush should be grown. When we come to have varieties, it will not be wise to plant a single variety alone. (See Fig. 55.)

For field planting, in a commercial way, a distance of eight feet apart, each way, is advised. As already indicated growing the fruit for market should only be undertaken where naturally favorable conditions prevail. The ideal soil is thought to be a peat covering with sand subsoil. The water-table should be at least a foot below the surface during the growing season. Summer fallowing the previous season, to destroy the wild growth, is advised on untilled land. Surface cultivation as for other fruits is to be given after planting.

Probable returns

The outcome of commercial huckleberry culture is yet to be determined. Young plants bear little until they are three or four years old, but are as long-lived as apple trees. They will not need replanting during one man's lifetime, and often reach a height of six to eight feet in the open field. Coville cites an Indiana plantation which was started in 1889 by setting unselected wild plants in a natural bog. Records for a period of six years show an average gross return of $243.44 an acre. The average selling price of the fruit was 14½ cents a quart. The cost of picking was 5 cents a quart. The

average profit to the acre, after deducting the cost of care, harvesting, marketing, interest, taxes, depreciation, and so on is placed at $116. With selected plants of improved quality, the fruit output will naturally be better.

Home culture

It is in the home-garden, especially, that the culture of this fruit should be greatly increased. Conditions there will seldom be ideal, and special care will be needed to secure results. The plants should be set in large holes or wide trenches, about a foot deep in a mixture of four parts peat or half-rotted oak leaves, to one part sand, which should be well mixed. Liberal dressings of similar material applied to the surface and worked in with the cultivation should also prove beneficial. Frequent repetitions of these surface applications will tend to maintain the acid conditions which the plant needs. A mulch of oak leaves, if it can be held in place, is useful.

If fertilizers are needed, chemicals which leave an acid residue in the soil should be chosen. Nitrogen may be obtained from sulfate of ammonia, phosphorus from acid phosphate, and potash from sulfate or muriate. No lime or wood ashes should be allowed near huckleberry plants.

Varieties

While named varieties are not yet available, the work done at the United States Department of Agriculture has shown much progress in the development of improved sorts. Wild plants vary greatly in the size and character of fruit. Two distinct types of the swamp blueberry are common in Rhode Island.

By selecting the best wild plants as a basis of work, then crossing and hybridizing these, some fine sorts have been developed in Coville's work. Individual fruits, under unusual conditions, have even reached a diameter of nearly three-fourths of an inch. Hybrids between *Vaccinium corymbosum* and *Vaccinium pennsylvanicum*, the low blueberry, are giving some promising results. A hybrid plant of this parentage, four years old, is shown at Plate XVI.

The future of this particular type of huckleberry or blueberry now looks bright. We may hope to bring it to our gardens and enjoy its fruits. The owner of land which is too wet and sour for ordinary farm crops may find profitable use for such land in the growing of this crop in a commercial way.

Species involved

Improvement work has been confined to the genus Vaccinium, this being the one most generally prized and the most promising for future development. Two species of Gaylussacia bear fruit of value, that of the common black huckleberry, *G. baccata*, better known as *G. resinosa*, being extensively gathered for market.

The most important difference between these two genera is that in Gaylussacia the fruit is ten-celled, each cell containing a single seed, or properly a little stone, while in Vaccinium there are several seeds in each cell, these being small, and the fruit forming a pulpy berry. The seeds of the former, while less numerous, are far more troublesome than those of the latter. The leaves and branchlets of Gaylussacia are clammy with resinous dots when young.

Many species belonging to these two genera are known,

chiefly in America, but only a few need be considered here. The following are most important as fruit-bearing plants, with possible adaptability to garden culture.

GAYLUSSACIA FRONDOSA, Torr. & Gray. Blue Tangleberry or Dangleberry.

This is a shrub growing from 3 to 5 feet high, with slender, divergent branches, which in the new growth are reddish yellow, while the older wood is covered with ashy gray bark. Its leaves are pale and glaucous or white beneath. The flowers are borne in long, loose, drooping racemes. The fruit is large, sweet, and pleasant, with a slight acidity, dark blue with a bluish white bloom, and ripening late.

The species is found along the Atlantic coast from New England to Florida and westward to Kentucky and Louisiana. In New England it is said to occur only near the coast. By some this is considered promising for cultivation. It grows more readily under culture than the following species, but seems to lack in productiveness.

GAYLUSSACIA BACCATA, K. Koch. (*Gaylussacia resinosa*, Torr. & Gray.) Black Huckleberry.

This is a much branched, rigid shrub, from 1 to 3 feet high. Its flowers are dull, reddish yellow, and borne in short, one-sided racemes or clusters. The fruit is sweet, crisp and firm, shiny black, without bloom. A white-fruited variety is occasionally found, and others are reported having pear-shaped berries, bluish fruit, or that which is covered with a bloom.

This species is found in open woods, on dry, rocky hills, and in swamps, from Newfoundland to Georgia, and westward to Minnesota and the Saskatchewan. It is the common black huckleberry of the market, and is well adapted to commercial purposes, owing to its firmness and consequent shipping qualities. It is said to be even more difficult to propagate and transplant than other huckleberries. The flavor of the fruit is altogether different from that of the Vacciniums. It possesses a strong, musky, or mawkish twang, hard to describe. For this reason it is not well liked by most persons, in the fresh stage. When cooked this flavor largely disappears.

The resulting sauce is richer but altogether different from that of the blueberries. It is found abundantly along the New England coast but does not appear to be highly prized. Late in the season much of the fruit becomes wormy. Another objection to the fruit of this genus is found in the little, hard, sharp-edged nutlets, which give the fruit a seedy character. The smaller the fruit the more noticeable this becomes, since there are ten of these stone-like seeds in each berry.

VACCINIUM PENNSYLVANICUM, Lam. Low or Dwarf Blueberry.

This is a low-growing shrubby little plant, seldom over a foot in height, with green, angular or warty branches. The leaves are bristly serrulate, smooth and shining on both sides, and the flowers are white or pale pink. The fruit is sweet and fine flavored, commonly blue with a glaucous bloom, though forms with nearly black fruit sometimes occur.

This is the earliest of the huckleberries to ripen, and one of the finest. It is not so firm as the preceding species, but with careful handling may be carried long distances, and is extensively sold in market. It is found upon dry, rocky hillsides and mountains from New Jersey to Illinois, and northward to Newfoundland and the Saskatchewan. It has not yielded readily to the demands of cultivation. The best results have ordinarily come from simply improving its natural conditions. A dwarf form of it, var. *angustifolium*, Gray, occurs in New England to Newfoundland.

VACCINIUM CANADENSE, Kalm. Canadian Blueberry.

This is a low shrub, 1 to 2 feet high, with light green wood, and much resembling *V. pennsylvanicum*. Its leaves are broader, entire, and downy on both sides, the crowded branchlets being also downy. The fruit is blue-black, ripening later than that of *V. pennsylvanicum*.

The species occurs in swamps and moist woods from Newfoundland to the mountains of Pennsylvania, and westward to Minnesota and the Rocky Mountains. It is primarily a northern species, and not common in the United States except in northern New England. From there and the Canadian provinces it is sent to the Boston market in considerable quantities after the home supply of the preceding species is exhausted.

Fig. 56. High-bush huckleberry or blueberry, *Vaccinium corymbosum.*

VACCINIUM VACILLANS, Kalm. Low or Pale Blueberry.

This is a low, glabrous shrub, from 1 to 3 feet high, with yellowish green stem and branchlets. The leaves are smooth and very pale and glaucous, at least on the under side. The berries are large and sweet, generally with a blue bloom, though sometimes black, ripening from the last of July to September. The fruit is borne in clusters at the end of leafless branches of the previous season's growth, and the plants are very prolific.

The species occurs chiefly in dry and sandy soil, from New England to Michigan and Iowa, and southward to Missouri and North Carolina. Growing as it does in dry soils, being a pretty little shrub for ornamental purposes, and a prolific bearer, with fruit of fine quality, it is one of the species which would seem to be promising for cultivation, or for use in hybridizing with other species.

VACCINIUM CORYMBOSUM, Linn. Swamp Blueberry. High Huckleberry. (Fig. 56.)

A tall, handsome shrub, from 4 to 10 feet high, with yellowish green branches which turn to a light gray with age, the bark on old stems becoming rough and peeling off in shreds. The leaves are narrow, mostly egg-shaped, either smooth or downy. The flowers are large, and borne on the extremities of the previous year's growth, as in the preceding species. The fruit ripens from August to the latter part of September, and is widely variable in shape, size, color and flavor.

The species varies greatly, and several botanical varieties have been described. It grows chiefly in swamps and moist woods, though sometimes found in dry, open pastures. It has a wide distribution, occurring throughout the eastern half of North America, from Newfoundland to Louisiana. It is the most promising of all the huckleberries for cultivation. It is the species with which most progress has already been made in the way of propagation and culture.

Insects attacking the huckleberry

In Washington County, Maine, is a tract of country comprising some two hundred fifty thousand acres, known as the "Blueberry Barrens." It is a region made up of

level or slightly rolling land, interspersed with lakes and swamps, where the low blueberries spring up in great abundance as soon as the land is burned over. The land is valued at about $50 an acre and the average yield of berries is about 60 bushels an acre. The fruit is gathered with rakes similar to cranberry rakes, a man being able to average about three bushels per day. During the picking season whole families move to the locality and live in tents while employed in the berry fields. A number of canneries are located in the vicinity to which the greater part of the fruit goes. The land is usually burned over every third year. This destroys the crop for that year but greatly increases it for the two succeeding years.

In this region insects have become more or less troublesome. A study of these enemies has been made by William C. Woods, and his findings are reported in "Bulletin No. 244" of the Maine Experiment Station, to which the reader is referred for a full account of this interesting industry and details of the insects found.

One of the most important enemies is the apple-maggot, *Rhagoletis pomonella*, Walsh., or a somewhat distinct strain of the species which seems to be found on the blueberry. The life history of the insect appears to be practically the same as on the apple. The insect has been found on different species, both of Vaccinium and Gaylussacia, though apparently not in other parts of the state. It is also found on the wild haw, which it is thought may have been the original host-plant of the insect. No means of control is suggested except systematic burning, and destroying the maggots which are found when the berries are winnowed.

A leaf-bettle, *Galerucella decora*, Say, was found to be destructive to the foliage of the low blueberries. Spraying would doubtless control it but is hardly feasible under ordinary conditions.

Among other insects mentioned, the currant fruit-weevil, *Pseudanthonomus validus*, Dietz., is of interest. This has been reported as a serious pest of the currant in Montana, and is found attacking two species of low blueberry in this region in Maine. Several other species are also treated.

JUNEBERRIES

The juneberry has received but little attention in cultivation, though not from any difficulty in growing it, as with the huckleberry. The greatest impetus to its culture came with the introduction of the variety known as Success. This was brought to notice by H. E. Van Deman, then chief of the Division of Pomology of the United States Department of Agriculture. It was found by him in Kansas,[1] having been brought from Illinois, where it had been grown from seeds gathered in the mountains of Pennsylvania. Van Deman gave it the name Success, and began selling plants about 1878. Some ten years later the stock was sold to J. T. Lovett, of New Jersey.

The juneberry has often been confused with the huckleberry in parts of the West. It was grown for a number of years by James Hall, of Davenport, Iowa, who, under the name huckleberry, recommended its extensive planting

[1] Annals of Horticulture, Bailey, 1891: 51.

as especially adapted to that region. On the strength of these recommendations many wild blueberry plants are said to have been sold throughout the state, much to the dissatisfaction of the purchasers. The true huckleberries or blueberries have never succeeded in this region, and only those who were deceived, and got the juneberry instead, obtained any real value for their investment. On the strength of these misrepresentations, the Iowa State Horticultural Society passed resolutions of censure, cautioning all persons against buying or planting any blueberry or huckleberry plants.[1] The Massachusetts Horticultural Society awarded a silver medal to Benjamin G. Smith for introducing the dwarf juneberry into that state,[2] and it is interesting to note that his plants were obtained from Davenport, Iowa, whence it was being so widely boomed as huckleberry or blueberry. The juneberry itself thrives well throughout the West, especially the western species, *Amelanchier alnifolia.*

The future of the juneberry is in doubt. It seems to be making little progress at present. Yet it thrives throughout the entire country, being especially promising upon the Plains, where many of our bush-fruits do not succeed. One point of great importance is its ability to endure late spring frosts. Of this one grower says:[3] "Frosts that killed potato tops to the ground had no effect in destroying even a portion of this wonderful plant's product, even though the frost came as late as the middle of May." The fruit is mild, sweet and pleasant. It lacks character

[1] Trans. Iowa Hort. Soc., 1877: 203.
[2] Gardener's Monthly, 1878: 306.
[3] Nebr. State Hort. Soc. Rept., 1896: 197.

and sprightliness as a table fruit, but this defect is readily overcome by adding a few currants, cherries or gooseberries, which are available at the same season of the year. To be at its best it should be used when perfectly fresh, for it suffers much in flavor by standing. This may prevent it from becoming popular as a market berry. In any case, it ought to be primarily a home berry. It is so easily grown, and the plants themselves are so attractive that it may well find place in any home-garden, however small.

One grave obstacle stands in the way of its successful culture. Every bird in the region will be there to help harvest the fruit. Only two remedies are apparent—either grow more juneberries than the birds can hold, or plant but few, in close clumps, and protect them with netting. Benjamin G. Smith reports [1] having been able to keep the birds away by scarecrows, which were changed in position two or three times a day. Experience with other fruit leads to the conclusion that very lively scarecrows would be needed to interfere with the birds of most localities. In Europe, cheap netting is used for protecting cherries and similar fruits, and this method could be adopted for a few clumps of juneberries with slight expense.

The productiveness of the dwarf varieties is beyond dispute. The plants are covered with a mass of fruit until ripe enough for the birds to consider it worth their attention. In Nebraska it ripens from June 10 to July 4, in New York somewhat later. It will thrive upon any soil, as it is found from the lowest swamps to the highest

[1] Gardener's Monthly, 1878: 306.

mountain tops. When once established it will care for itself, if necessary, though benefited by good cultivation and attention. It is absolutely hardy, and a plantation will continue to thrive and bear fruit almost indefinitely.

The juneberry is said to propagate from seeds as readily as apples. It is more commonly multiplied from the sprouts which spring up around the base of the plants. One Iowa grower recommends root-grafting it on apple seedlings.[1] It has been recommended as a satisfactory stock upon which to graft the pear.[2] It has also been reported from Illinois as a particularly suitable stock for the quince,[3] causing the fruit to mature earlier and endure the winter better.

Enemies will doubtless appear, should the juneberry come to be generally cultivated. Already it has been noted [4] that the plum curculio is frequently found among the bushes, and many of the fruits are stung by them. The berries were also found to be injured by a coleopterous larva, not determined.

The different species are so variable in the wild state that varieties would doubtless multiply rapidly were they to come into general cultivation. Already several have been named. The one known as Success, previously mentioned, is doubtless the most widely known.

The genus Amelanchier, to which the juneberries belong, is closely related to the genus Pyrus, which includes the apple and pear. The species are not numerous, and all

[1] Trans. Iowa Hort. Soc., 1880: 130.
[2] Gardener's Monthly, 1861: 229, 300 and 361.
[3] Trans. Iowa Hort. Soc. 1879: 440.
[4] Insect Life, 3: 219.

Fig. 57. *Amelanchier alnifolia.*

are closely related. The following are of most interest from a horticultural standpoint:

AMELANCHIER CANADENSIS, Medic. Shad Bush. Juneberry.
This is the best known form in the eastern part of the country.

It often reaches a height of forty feet, with a tall straight trunk and small spreading branches, forming a narrow, oblong, round-topped tree. It occurs from Newfoundland to Florida, west to Louisiana and eastern Nebraska, and farther northward to the Rocky Mountains. Though a desirable ornamental tree, its large size is against it as a fruit-bearing plant. Many of the trees growing wild appear to be sterile. The hills are dotted with their white bloom in early springtime, but comparatively few fruiting trees are found in summer.

A. OBLONGIFOLIA, Roem. Dwarf Juneberry.

This is a low plant, from two to five feet high, bearing smaller flowers than the preceding species. It is found from Quebec and New Brunswick to Virginia, and west to Missouri and Minnesota, and is one of the most promising forms for cultivation. The variety known as Success belongs here.

A. BARTRAMIANA, Roem. Northern Dwarf Juneberry.

This is another dwarf form, two to four feet high, found in cold swamps and mountain bogs from New York and Northern New England northward to Labrador and Newfoundland. It is highly recommended as an ornamental plant and the fruit is said to be large, dark blue-purple, with a heavy bloom, often nearly twice as long as broad, sweet, with a more decided flavor than that of the other Juneberries.

A. ALNIFOLIA, Nutt. Western Service Berry or Shad Bush. (Fig. 57.)

This is a low shrub, usually only a few feet high, though rarely becoming a slender tree. The leaves are broad, oval or nearly circular in outline, and the fruit ripens from June to September, according to location. It is dark blue, or sometimes nearly black, covered with a glaucous bloom, very sweet and juicy, and is said to reach from half an inch to nearly an inch in diameter. The species is widely distributed over the western half of the continent, extending eastward as far as the western shores of Lake Superior and the northern peninsula of Michigan. It is one of the most promising species as a fruit-producing plant. Its great productiveness and the large size and good quality of its fruit are likely to place it in the lead for the western half of the country, at least.

Fig. 58. The tree cranberry.

THE TREE CRANBERRY (Fig. 58)

The so-called tree cranberry or cranberry-tree is not a cranberry in any sense of the word. It has received this name owing to a superficial resemblance of its fruit to that of the cranberry. Though round and red like the cranberry, in structure and flavor it is entirely different. The plant belongs to the honeysuckle family, the species

being *Viburnum Opulus*, Linn. It is a tall and nearly smooth shrub, with gray bark, scaly buds and large, three to five-lobed leaves, the lobes pointed and commonly few-toothed. The flowers are white, borne in broad, flat clusters, and are followed by the bright-colored fruit which is carried on the tips of the branches, well above the leaves. The species is much better known in the modified form in which it commonly appears in cultivation, which is the guelder rose or snowball so frequently planted upon lawns. In that form it has become entirely sterile, by the culture adopted to bring out the spherical head of bloom. In the wild type only the marginal florets are neutral.

The species is found wild in the northern parts of Europe, Asia and North Africa, and is in many respects a more desirable ornamental plant than its modified descendant. Although pleasing in habit and foliage, it is especially attractive in fruit. About the last of July the berries take on a greenish yellow or orange hue, tinged with bright red on the side toward the sun. From that time until spring, unless taken by the birds, which commonly do not molest it when other food is abundant, the fruit is always attractive. When ripe in autumn it becomes a brilliant deep scarlet and remains so until severe frosts, which cause it to become somewhat duller, though it will remain bright all winter if allowed to hang. This renders the plant attractive throughout the greater portion of the year. Its flowers, too, are as graceful as those of the sterile form. The American tree cranberry is somewhat different from the Old World plant, and botanists now separate it as *Viburnum americanum.*

The plant deserves praise as an ornamental, but as a fruit-producing plant it is of doubtful value. The fruit is very sour, somewhat resembling the true cranberry. It is used to some extent as a substitute for it, and makes good sauce or jelly, though too astringent to suit some palates. The large size of its seeds is a serious objection to its use for fruit. These are single hard stones, which seem to make up the greater part of the fruit. Except for this it might have value in some localities. Its fruit falls in much the same class as that of the barberry and the buffalo berry, though not so pleasant as the latter. Its name, tree cranberry, is a standing temptation to smooth-tongued agents to recommend the plant as a satisfactory substitute for the cranberry, suited to upland soils and regions in which the cranberry does not succeed. In such cases it must prove a disappointment, though worthy of praise for the purposes to which it is adapted. The plant is perfectly hardy, so far as cold is concerned, and can be grown in almost any soil or location. It may be propagated by layers, by hard-wood cuttings, or by seeds, though the latter require two years for germination. The plant is much subject to the attacks of plant-lice, which often cause its leaves and young shoots to curl and grow distorted. This seriously injures the appearance of the plant in seasons which favor the spread of these pests.

THE BARBERRY

Unlike many of the fruits which we have been considering, the barberry has once been popular and has since declined in favor. It may, therefore, be appropriate to

substitute for a modern description of the plant that given by Gerarde in 1597. He says: "The barberry plant is an high shrub or bush, having many young straight shoots and branches very full of white prickly thorns, the rind whereof is smooth and thin, the wood itself yellow: the leaves are long, very greene, sleightly nicked about the edges, and of a soure taste: the flours be yellow, standing in clusters upon long stems: in their places come up long berries, slender, red when they be ripe, with a little hard kernell or stone within, of a soure and sharp taste: the root is yellow, disperseth it self far abroad, and is of a wooddy substance. Wee have in our London gardens another sort, whose fruit is like in form and substance, but one berry is as big as three of the common kinde, wherein consisteth the difference. We have likewise another without any stone, the fruit is like the rest of the Barberries both in substance and taste."

In regard to its distribution, Gerarde says: "The barberry bush grows of it selfe in untoiled places and desart grounds, in woods and the borders of fields, especially about a gentlemans house called Mr. Monke, at a village called Iver two miles from Colebrooke, where most of the hedges are nothing else but Barberry bushes. They are planted in most of our English gardens."

Among "The Vertues" ascribed to the plant, the following are of special interest. "The leaves are used of divers to season meat with, and instead of a sallad, as be those of Sorrell." After enumerating various medicinal "vertues" he adds: "A conserve made of the fruit and sugar performeth all those things before remembered, & with better force and successe."

Phillips, writing in 1822,[1] quotes from another author as follows: "Barberries are of an agreeable, cooling, astringent taste, which creates appetite." He further says: "Pickled barberries make a handsome garnish for all white dishes, where acids can be introduced: this fruit is also used for making syrup, lozenges, &c. We have now several varieties of barberry-shrub cultivated in England, one of which was brought from Candia in 1759, and another from Siberia in 1790, but it possesses no advantage over our native kind of this fruit."

This common barberry of Europe, *Berberis vulgaris*, has become naturalized in New England and westward, and is more or less widely planted elsewhere. Downing gives it a brief notice [2] and Fuller [3] enters into a somewhat extended discussion of it, mentioning a number of species and varieties.

It is chiefly planted for ornament, rather than fruit, and for this purpose the purple-leaved species, *Berberis Thunbergii*, known as the Japanese barberry, which has inferior fruit, is generally preferred.

Downing says that "The barberry is too acid to eat, but it makes an agreeable preserve and jelly, and an ornamental pickle for garnishing some dishes." It comes into use later than the currant and probably fills about the same place that the buffalo berry might, were that more generally cultivated. Hoskins, of Vermont, who had both growing, reported it far more productive than the buffalo berry, adding that although his plants were set

[1] Pomarium Britanicum, p. 62.

[2] Fruits and Fruit Trees of Amer., p. 442.

[3] Small-Fruit Culturist, p. 20.

on the lawn for ornament, a good market had been found for the fruit.

Doubtless the barberry would make good jelly, but so do the apple and the currant, which are more easily prepared. The Japanese quince has even more claim to merit as a fruit bearing ornamental than have the viburnum and the barberry.

Barberries may be propagated by seeds, which should be sown or stratified in the fall, or by separating the suckers which spring up about the main stem. They may also be grown from cuttings of one or two-year-old wood, taken in the fall, or treated like currant and gooseberry cuttings, though they do not root so readily as these plants.

The merits of the barberry as an ornamental plant need not be further discussed, but as a fruit-producing plant it may teach a lesson. We talk much of the improvement of wild fruits, and are almost led to believe that we can take anything that is edible, no matter how small, hard, sour, puckery or thorny it may be, and by careful selection and hybridizing, produce from it a fruit which shall delight the taste and swell the purse of coming generations. Does not the history of the barberry suggest that, after all, there may be some things not worth improving?

THE SAND-CHERRY

Although its relationships might more naturally classify it among the stone-fruits, the western sand-cherry may well be mentioned in the discussion of miscellaneous bush-fruits. This plant is known botanically as *Prunus*

Besseyi, Bailey.[1] It is a graceful, somewhat spreading shrub, 3 to 4 feet high, with slender, ascending or slightly drooping branches. At flowering time the leaves are small, narrowly oblanceolate, and slightly whitened beneath, but at maturity they become oval or elliptic, very bright and shining on both sides. The flowers are borne in axillary clusters all along the younger branches, so that at blossoming time these are one mass of bloom. The fruit ranges from three-eighths to five-eighths of an inch in diameter, and is usually very dark purple or blackish in color. In flavor it resembles the improved forms of the eastern choke cherry, *Prunus virginiana*, occasionally found in cultivation, but is larger.

The species is found wild from Manitoba to Kansas and westward to the mountains of Colorado and Utah. Its value as a fruit-plant has been urged from time to time, and it was introduced from Colorado as the improved dwarf Rocky Mountain cherry. Plants received under this name had been growing in the grounds of the Nebraska Experiment Station for several years, and although white with blossoms in springtime, none of the fruit matured until wild plants were set in the same garden, probably owing to a lack of proper fecundation.

Similar lack of fruitfulness sometimes occurs when wild plants are removed to the garden, though as a rule they are immensely productive. Wild plants set in the spring of 1895 were loaded with fruit in 1897. The size varies much on different plants, showing abundant opportunity for selection. It ripens after other cherries, from the

[1] For a fuller account of the species, see Cornell University Experiment Station Bulletin, 38: 58–65, and 70: 260–262.

middle to the last of July, in Nebraska. The largest fruits are about equal in size to the Early Richmond and English Morello, as grown there. Although somewhat astringent, it is rather pleasant to eat out of hand. It should be left until fully ripe, for this astringency is then less noticeable. Any eastern housewife who has known the value of the better forms of the eastern choke-cherry, though such are few, for that species is little known in cultivation, will be able to appreciate the merits of the sand-cherry as a fruit. Many western housewives know it already. It makes excellent sauce and admirable jelly, and is, no doubt, equally good for pies.

Those familiar with the cultivated choke-cherry find that when its fruits are fully ripe their astringency may be almost wholly removed by rolling them in a sack or shaking them in a closed dish. When so treated they make an excellent dish, eaten raw with sugar and cream. A similar treatment might improve the sand-cherry.

Whatever value the sand-cherry may have as a fruit-producing plant in the future pomology of the country, its position as an ornamental shrub is assured. There is no shrub more useful for ornamental planting on the Plains than this. It is perfectly hardy, well adapted to the region, and is a rapid and vigorous grower.

As a low-growing shrub, or as a foreground for larger groups, it can hardly be surpassed. In the plantings on the campus of the University of Nebraska, it has been used more extensively than anything else.

The broad-leaved evergreens, such as rhododendrons, mahonias and kalmias, do not succeed in the dry and trying climate of the Plains, but this plant is a very satis-

factory substitute during more than half the year. It is one of the first to awaken in spring and one of the last to hold its leaves in the fall, being unharmed by the first frosts, which ruin the effect of many ornamental shrubs. Its bright, clean, glossy foliage closely approaches that of the broad-leaved evergreens in effect. It has also the very desirable quality of presenting beautiful autumn tints, as a parting picture to be held in remembrance during the dreary days of winter, a quality all too rare among the plants of the Plains, but one which is fully appreciated by all who recall the flaming hillsides of an eastern October day.

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